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AUGUST, 1940

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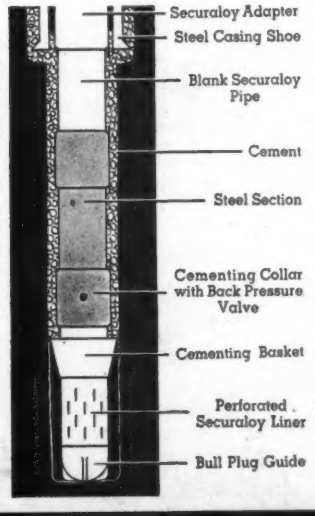

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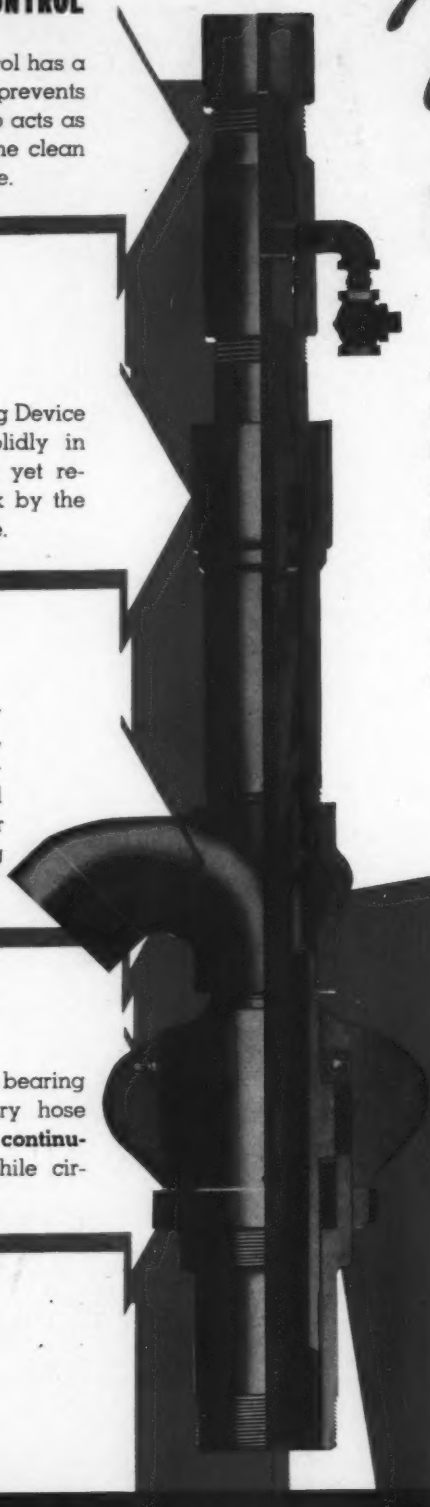

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IN THIS ISSUE

Cementing Practices in California—Part II 3

Natural Gasoline and its Relation to Aviation Gasolines 18

Laugh This Off 24

San Joaquin Valley Development 26

Los Angeles Basin Development 30

Coastal District Development 34

Crude Oil Production 40

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Cementing Practices in California Oil Fields

Multiple Zone and Squeeze Jobs PART II

By Wallace A. Sawdon,
Petroleum Engineer, Los Angeles

Methods and Equipment for Multiple Zone Shut-Offs, Squeeze Cementing Well Repair Work

The placement of cement behind casing or liner in stages has been greatly facilitated by equipment designed for the purpose. The slurry is pumped around the shoe and/or through outlets provided up the casing at one or more places either to make a continuous cement encasement of the pipe from the shoe to the top of the job or to cement sections of the casing or liner between producing zones.

The cementing of a string of casing by stages when the cement is to extend continuously for a great distance up behind the pipe gives greater assurance that the upper portion of the job will be free of the channeling which is likely to occur when the total amount of cement must flow up behind the pipe from the shoe. Moreover, when the large quantities necessary for such a job are used, the time for placing the cement for each stage will be shorter since the cement above the outlets for an upper stage does not have to travel the extra distance to the shoe and then retrace the same distance up behind the pipe. The use of more than one stage for a continuous encasement with cement is probably most advantageous when several prospective producing zones intermingled with water bearing strata are to be tested by gun perforating or when such zones, although well defined in location, are to be produced through perforations made after the casing or liner has been cemented.

Cementing For Multiple Zone Production

Whether or not the production from two or more zones in a well are to be segregated, blank sections in the casing or liner lying between the producing zones will generally have to be cemented. Frequently two strata of one zone will have to be separated by a cemented section of pipe as is often necessary in the Upper Terminal zone of the Wilmington field. In other cases more than two strata in one general zone have to be separated as in a number of wells in the deep producing horizon at Kettleman Hills. Probably the majority of multiple zone wells are completed with liners hung in the water string although some are equipped with a full string from surface to the bottom of the hole. The wells are generally stopped in the lowest oil zone and the liners are made up with perforations or slots to lie opposite the productive zones and blank pipe between each perforated section. The series of cement jobs therefore usually starts just above the deepest producing zone and it is more or less exceptional when the liner is cemented below the lowest perforated section. When hole is carried too far, however, and bottom water is encountered, the cement job thus necessitated becomes one of the stages.

Several methods and several types of equipment are used in California for cementing between the productive zones. In the early development of the Wilmington-Long Beach Harbor District cement retainers and the "stacking" method were employed to the greatest extent. After the development of the "duplex" cementing equipment this was widely used for the lower two stages and cement retainers for the top job when three stages were employed. The "multiple stage collar" in connection with the lower portion of a perforation washer was also used but this has now been superseded by the "removable cementer-C.P. type." A little over a year ago a "series cementing method" was developed and came into extensive use.

To protect the perforations from any sloughing of the formations while running in the liner and to keep the cement slurry from passing down the hole after it has passed into the annular space between the liner and the wall of the hole, a ce-

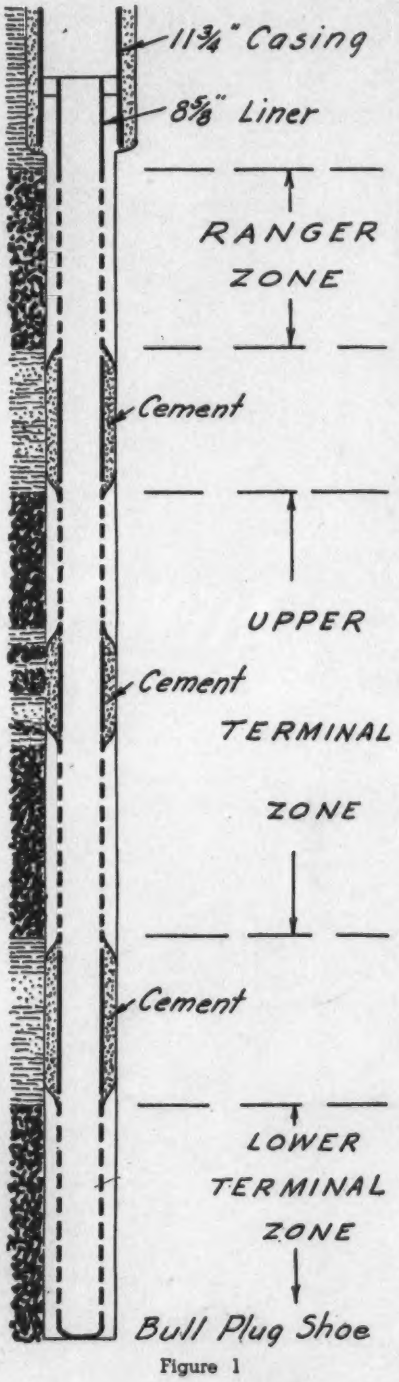

Figure 1

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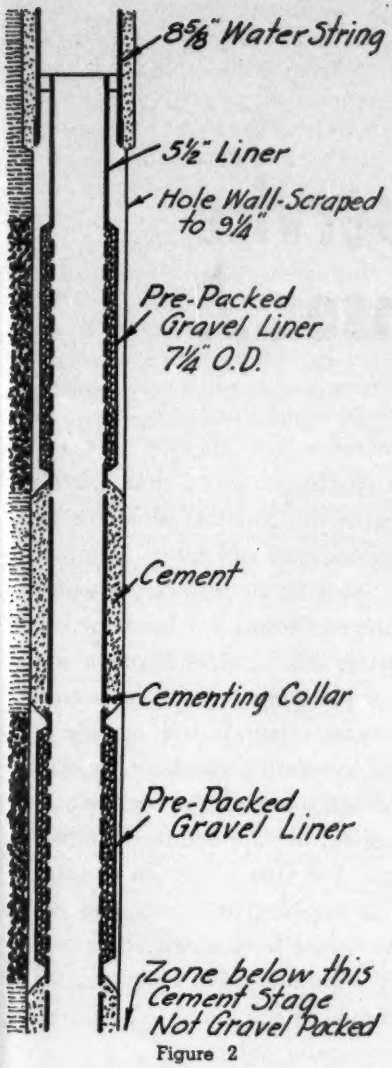

Figure 2

menting basket is generally placed just below the cementing ports at the bottom of the blank section of pipe to be cemented. When there is a perforated section of pipe for production above the blank section, an inverted cementing basket is frequently placed at the top of the blank in order to keep the cement from passing up to contaminate the perforations and the face of the oil zone above. When this inverted basket is used a return fluid port is provided just below where it is attached to the liner. A typical cementing job in the Wilmington field is given in Fig. 1 which shows all cement stages completed and the hole cleaned out ready for completion.

While the more general practice in California at the present time is to use alternate perforated and blank sections of liner for multiple zone production, there have been wells in which the stage jobs have been done by running a liner string made up entirely of blank pipe and, after cementing it solidly from the bottom to the shoe of the water string, gun perforating the different zones. In doing this the cement is placed in stages with outlets for cement at each stage provided just above a productive zone in the same manner as when perforated sections are used.

In the Wilmington field where gravel packing has been found effective for handling the sand made by some of the zones, pre-packed gravel liner has been used for one or more sections. The cementing of the blank pipe between the pre-packed sections is done in the same manner as when conventional slotted or perforated pipe is used. The use of pre-packed liner through two zones with blank pipe cemented between is illustrated by Fig. 2.

In using the "series cementing method" for cementing in two or more stages, the liner is generally made up of a perforated section on bottom and other perforated sections to lie opposite the upper producing zones. Between these are sections of blank liner, at the bottom of each of which is a series cementing collar and a cementing basket. At the top of the blank section is an inverted cementing basket which has its bottom or open end wired close to the pipe to permit it to be run into the well. When the liner is landed, a cementing string is run in and positioned in each collar successively from the lowest one up in order to discharge cement slurry through the whirler ports in the collars at whatever pressure may be necessary. The cementing string is not pulled out of the well until all stages are completed. The sequence of operations is shown in Fig. 3.

As shown in the drawings, the cementing collar is made with whirler ports for passage of the cement slurry to the annular space be-

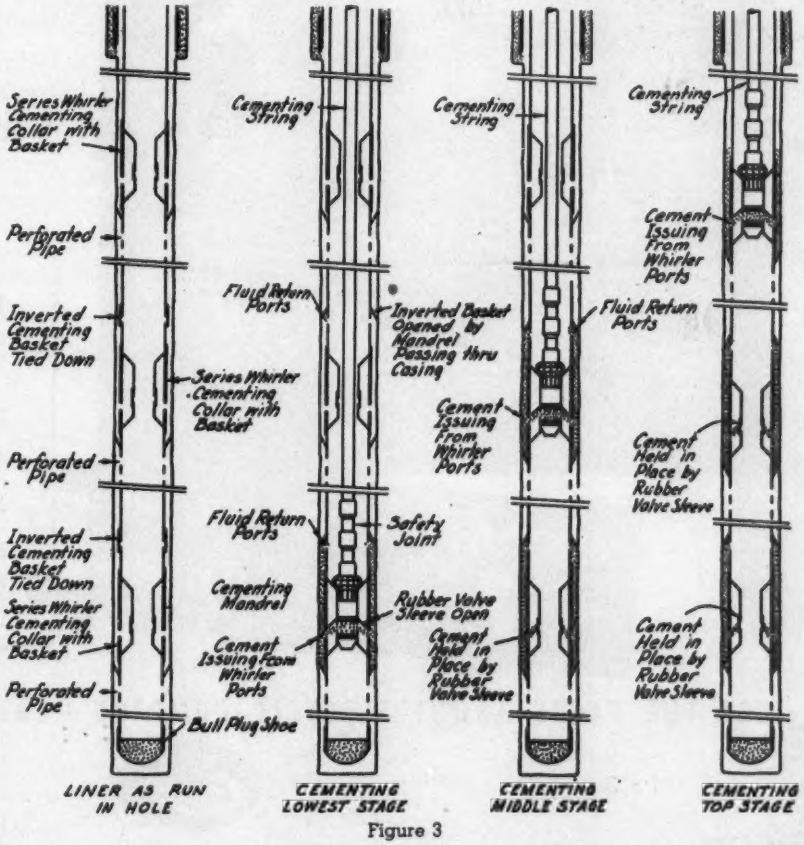
Series Whirler Cementing Collar with Basket
Perforated Pipe
Inverted Cementing Basket Tied Down
Series Whirler Cementing Collar with Basket
Perforated Pipe
Inverted Cementing Basket Tied Down
Series Whirler Cementing Collar with Basket
Perforated Pipe
Bull Plug Shoe
LINER AS RUN IN HOLE
Cementing String
Fluid Return Ports
Series Whirler Cementing Collar with Basket
Fluid Return Ports
Cementing Mandrel
Cement Issuing From Whirler Ports
CEMENTING LOWEST STAGE
Cementing String
Inverted Basket Opened by Mandrel Passing thru Casing
Cement Issuing From Whirler Ports
Safety Joint
Rubber Valve Sleeve Open
Cement Held in Place by Rubber Valve Sleeve
CEMENTING MIDDLE STAGE
Cementing String
Cement Issuing From Whirler Ports
Fluid Return Ports
Cement Held in Place by Rubber Valve Sleeve
Cement Held in Place by Rubber Valve Sleeve
CEMENTING TOP STAGE

Figure 3

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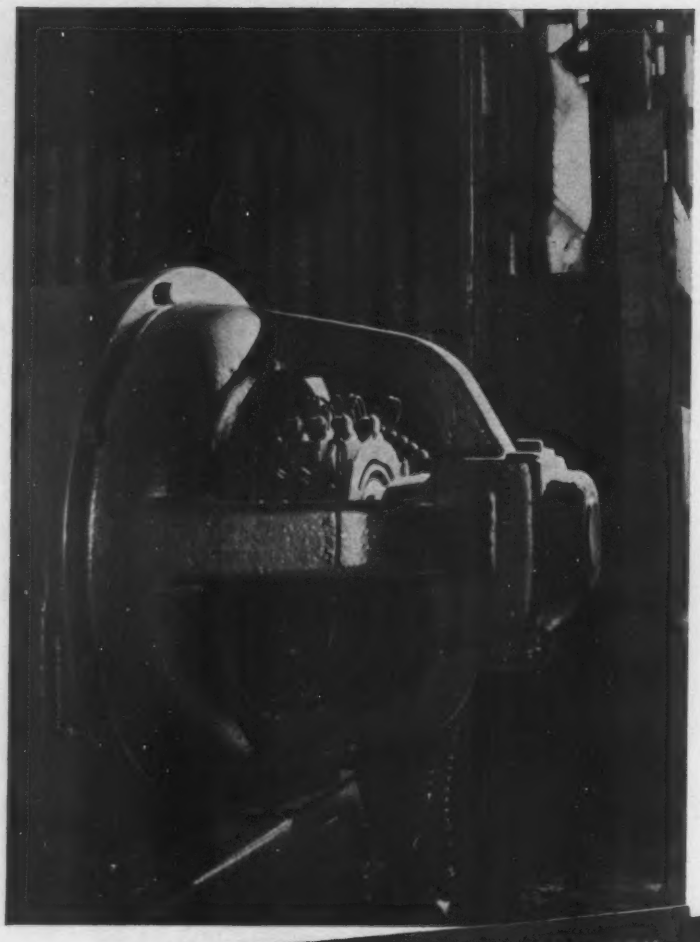

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tween the blank liner and the wall of the hole. An inner body or sleeve made of drillable metal is anchored within the collar with both ends sealed to prevent by-passing of fluid or cement. Circulation holes allow passage of the slurry through this body into an annular chamber between the sleeves and the collar and these holes are covered on the outside of the body by a rubber valve sleeve. This prevents return of cement after it has passed through the circulation holes. From the chamber the slurry is forced through the whirler ports upward and around the blank pipe.

The cementing string is tubing or drill pipe on the bottom of which is a mandrel through which free circulation is maintained until it is tripped. The string is run into the well until the mandrel reaches a point below the bottom cementing collar where it is tripped by a bronze ball dropped into the string to seat in the mandrel. Hydraulic pressure is then applied to release a latch and further pressure to release the tripping ball seat and force the ball and seat down until stopped by a shoulder in the bottom of the mandrel. The travel of the ball and its seat uncover circulation holes and by shutting off passage of fluid through the mandrel force the cement slurry (when later pumped down the cementing string) to pass out the holes.

The mandrel is raised until it is above the cementing collar; it is then lowered until the latch seats on the upper end of the collar. In this position the circulation holes in the mandrel line up with those in the collar and cement now pumped down the tubing is forced out these holes and through the whirler ports into the annulus behind the pipe. After the lowest cementing job has been completed the mandrel is raised to above the next cementing collar and then lowered until the latch seats on the top of this collar so that the second job can be done. Successive jobs up the hole are performed in the same manner and the string removed after the last one has been completed. The inner sleeves made of drillable metal are drilled out and the well completed.

The operation of the "removable cementer-C.P. type" in cementing one stage of a series is shown in Fig. 4. The equipment is run in on a string of tubing or drill pipe. At the top are slips for anchoring the tool in the casing during the cementing operations and below these a spear and "J" lock assembly. The body of the tool is an outer barrel to which are attached high pressure pack-off rubbers for packing off the casing above and below the cementing ports in the casing. An inner telescopic member provides control over the direction of flow of fluid through the cementer. While being run, fluid in the hole is by-passed around the rubbers through fluid ports to eliminate floating action.

The tool is first positioned below the cementing point and the slips set with a slight rotation to the right. This prevents further downward movement but does not stop upward movement of the cementer. A little of the weight of the string is set down on the tool and the rod fluid ports moved to a position opposite the mandrel ports. The pumps are started up and pressure applied. Since the fluid after passing through the mandrel ports is prevented by the pack-off rubbers from movement up or down, the pumps will stall until the cementing point is reached. The tool is raised in one or two-foot stages until fluid can be pumped away and the cementing point thus located. The cement slurry is then pumped down the run-in string, out the mandrel ports and thence out the cementing

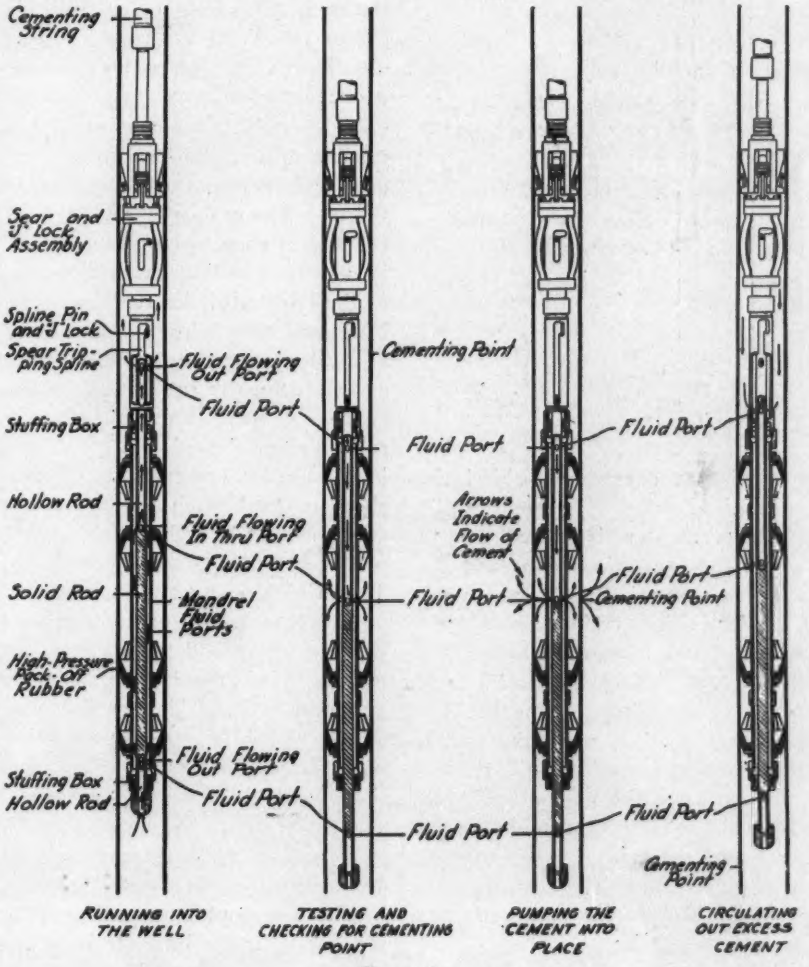

Figure 4

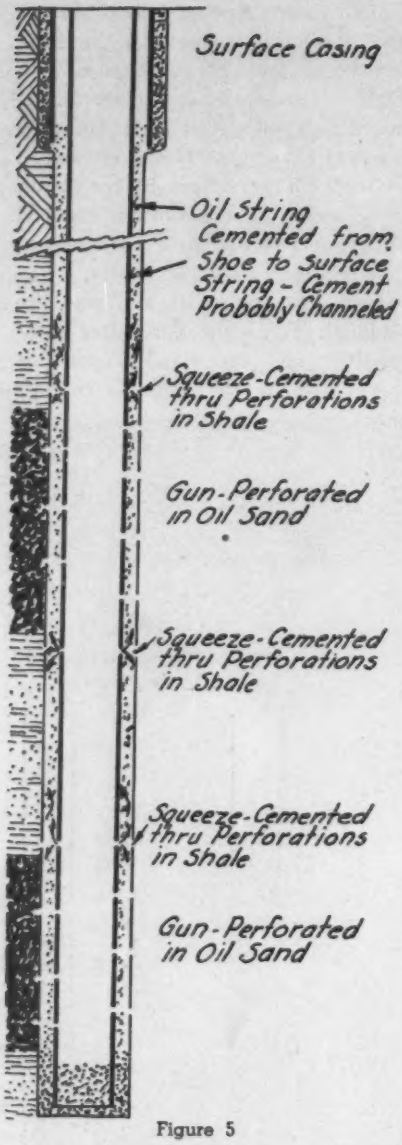
Surface Casing
Oil String Cemented from Shoe to Surface
String - Cement Probably Channeled
Squeeze-Cemented thru Perforations in Shale
Gun-Perforated in Oil Sand
Squeeze-Cemented thru Perforations in Shale
Squeeze-Cemented thru Perforations in Shale
Gun-Perforated in Oil Sand

Figure 5

ports into the annulus behind the casing.

The cementer is pulled up to above the cementing point and the run-in string raised 18 in. above the closed position. The upper fluid by-pass ports are then above the uppermost stuffing box and permit pumping out excess cement either by direct or reverse circulation. If it is desired to wash out the cement from between the pack-off rubbers, the tool is left in the closed position and, with reverse circulation, fluid pumped down behind the upper rubbers, in through the mandrel ports and up the tubing.

When one stage is completed the cementer is pulled up to the next cementing point and the process repeated. In coming up the hole after cementing a blank section of pipe below a perforated section, the lower perforations of this section can be washed if no inverted cementing basket has been used and there is felt to be a chance of the cement having contaminated the slots or holes. This is done by stopping the tool in closed position at the perforations and pumping fluid to clean them out.

In cementing by stages for multiple zone production as at Wilmington, this equipment is run in liner made up of alternate perforated and blank sections with cementing collars at the bottom of the blank sections to be cemented. The cementing ports through these collars are equipped with clapper valves which close after the cement has passed through. Cementing baskets are placed below the collars to protect the perforated pipe and producing zone below.

At Montebello a recent method of cementing with the removable cementer has been as illustrated in Fig. 5. The casing is run through the lowest zone to be produced and is cemented solidly from the shoe to the bottom of the surface string. The shale beds below and above the producing zones are gun-perforated and the cementer run in and used to squeeze cement through the perforations since the original cementing job done by cementing from the shoe to the bottom of the surface string cannot be relied upon to protect the producing zones effectively. The original cement does, however, protect the zones enough to test for production and thus provide for location of the productive strata by gun perforating. The recementing above and below the productive zones gives more assured protection from the intermediate water usually present.

Cementing in stages by use of "duplex equipment" is illustrated by Fig. 6. The duplex cementing collar is made up in the liner string at the bottom of the lowest blank section of pipe and a bridging collar at the bottom of the next blank section above. When the liner has been landed the cementing string, consisting of tubing or drill pipe with a circulation joint and sub at its lower end, is run in and screwed into the collar with left-hand square threads. The cement is pumped down the cementing string and out through whirler ports in the collar and is kept from returning back into the casing by a ball back-pressure valve. The cementing string is then unscrewed and pulled out and a bridging ball dropped into the casing to seat on the bridging collar for cementing the next stage above.

In cementing this second stage either the conventional plug method or a cement retainer can be employed. If the plug method is to be used, a baffle collar with hole large enough to pass the bridging ball is made up in the liner at a point approximately where the cement retainer is shown in the drawing in order to stop the plug. Cement pumped down either with the plug method or through a retainer is forced out whirler ports in the bridging collar as indicated.

If more than two stages are to be cemented when using the duplex equipment, a cementing collar is generally made up in the liner at the bottom of the blank section of pipe located between the higher productive zones. Cement retainers may then be used for the job, setting one as a bridge plug below the collar and another above for placing the cement. In some wells the duplex collar has been used for the lowest job and the removable cementer for the stages above.

With the "stacking method" employed by some companies, a section of liner is made up of perforated pipe on bottom and blank pipe on top. This is run to bottom on drill pipe. At the bottom of the blank pipe is a whirler float collar provided with a solid cement baffle below its discharge ports. At the top the liner is belled out for a length of ten feet, the 6⅝-in. pipe being

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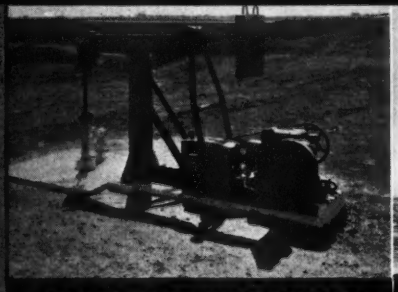

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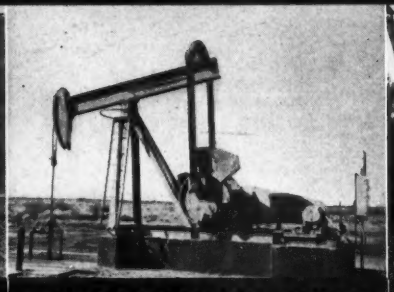

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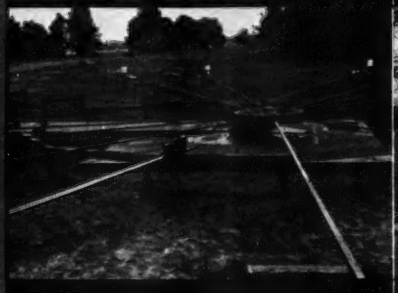

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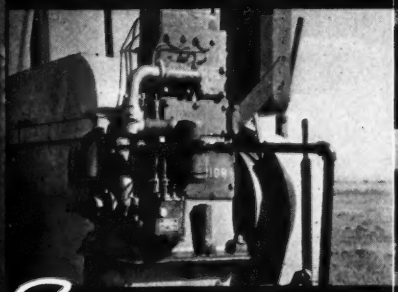

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expanded to a diameter of 7⅝ inches. The section of liner is equipped with a special adapter and the drill pipe on which it is run in packed off within the pipe. The cement is pumped down the drill pipe and out the ports in the collar.

When the cementing is completed the drill pipe string is backed off and pulled out of the hole, carrying the packing member with it. Before running the next section the cement is allowed to set and the liner cleaned out. The second section, made up similarly of perforated pipe on bottom and blank pipe on top, is then run in and stabbed into the enlarged top of the section below. This upper section rests on a lead seal or beveled seat which is provided at the bottom of the belled portion of the liner. The second section is cemented in the same manner as the first one and further sections run and cemented in the same way. This method is not used in slant holes of which there are a number in the Long Beach Harbor-Wilmington District.

Stage cementing can, of course, be done entirely with cement retainers, setting one retainer as a bridge plug below the openings provided for passage of the cement and another one above these openings for placement of the slurry. This method was followed extensively in the early development of the Wilmington, Kettleman Hills and Montebello fields. In case of failures of any stage, the cement retainer has been widely used for recementing and is particularly adaptable where high pressures are necessary.

Squeeze Cementing

By squeeze cementing is meant the forcing of cement slurry into some interstices in a formation or imperfectly filled annulus behind pipe, the displacement of the slurry not resulting from any appreciable circulation to the surface or free flow into a thief stratum or cavity. The slurry is applied under a pressure that is capable of forcing at least a portion of the cement into the interstices to such an extent that it forms an effective barrier to the passage of any fluid into the well. Squeeze cementing is now being extensively used for recementing both around the shoe and at necessary points up the pipe; for shutting off gas or water in open hole or behind casing or liner, both in new completions and repair of old wells; for plugging operations and for meeting many specific conditions which are peculiar to individual wells.

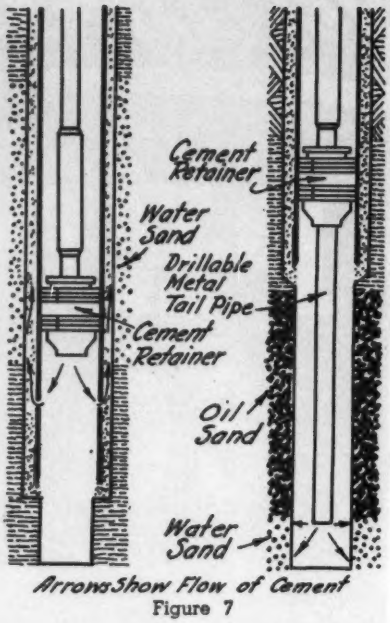


Figure 7

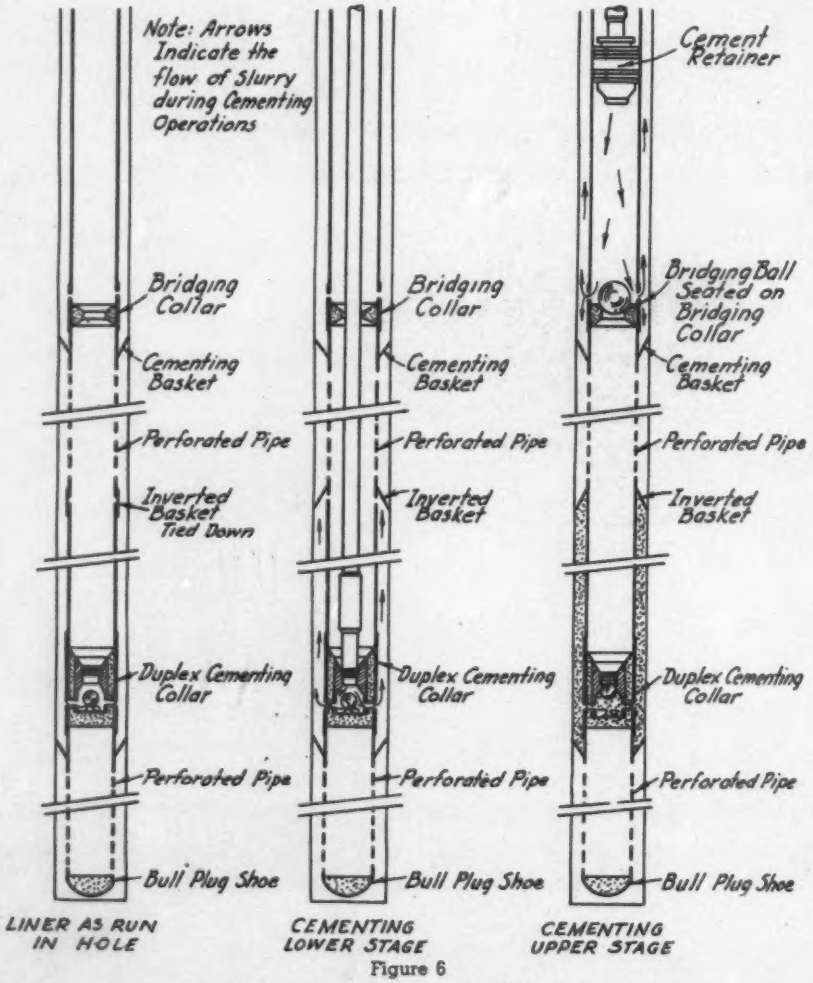


Figure 6

The actual deposition of the cement by the squeezing operation and what makes it effective still raises a controversial question. A gas or water sand has too low a permeability to permit penetration by the slurry to any appreciable distance beyond its face. Such a sand from which the fluid has passed for some time will contain channels which provide passageways for the cement slurry and there is every reason to believe that the slurry

can be squeezed into these channels with comparative ease. On recementing jobs where the original cement is ineffective there must also be channels within the cement body itself which can be filled with cement applied under pressure.

When squeezing off formations in newer wells the proposition is different. There has been evidence that the high pressures applied have ruptured the formations along planes of weakness and this action has provided channels for the passage of the cement. Whether these deposits are sufficient to prevent the flow of fluid under formation pressure will probably depend on the formation pressure itself and the differential across the face of the sand. If the slurry is put in under proper pressure and this pressure maintained on the cement until it has set there seems to be no reason why it should not hold. Moreover, some water sands take a comparatively large volume of cement under pressure, the water courses in the sand probably providing passageways for the slurry.

The possibility must be considered, however, that the shut-off may be due, at least in part, to the formation of a cement filter cake on the face of the sand and that chemical precipitation may be cementing the sand although the cementation may be but a small fraction of an inch beyond the sand face. Such a cement cake on the sand would be protected by the volume of cement hole-ward from the face. When the squeeze is done in open hole and the hole has to be cleaned out afterwards, there is great chance of injuring the effective seal. However, this is probably just as true if the seal is obtained by channels broken into the sand and may account for the greater success secured by squeeze cementing behind pipe than in open hole. In any case, some portion of the cement is pumped away although the quantity may be very small; and either all or part of this portion is effective in the successful squeeze jobs.

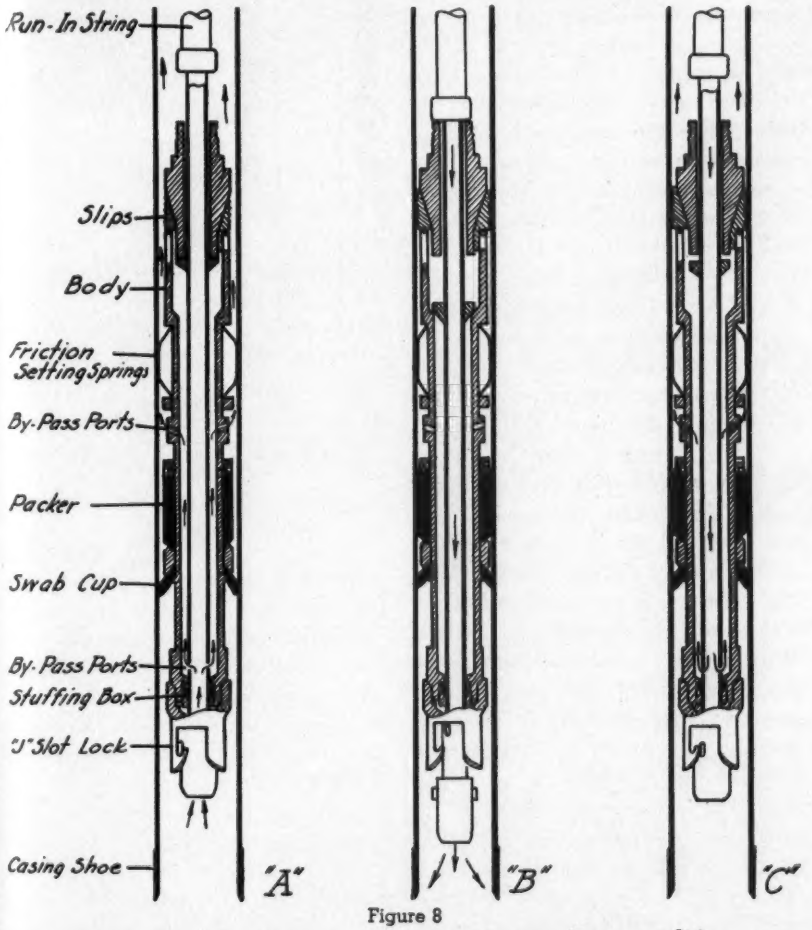


Figure 8

"A" shows running-in position with arrows indicating flow of fluid in hole passing through the tool. In "B" the slips are set and inner barrel lowered to test tool and formation. At "C" the inner barrel is raised to the by-pass position and arrows show direction of flow of fluid being pumped down the tubing or drill pipe. The inner barrel is again lowered to position "B" for passage of cement through the tool to perform the squeeze job. To clean out excess cement the cementing tool is raised to the by-pass position "C" and fluid pumped down by reverse circulation in direction opposite to that shown by the arrows. To pull out of the hole the slips are released and packer elongates to its original position as shown in "A".

Breakdown of the formation before the cement is applied is usually necessary to open the way for the slurry. This is generally done with water and the pressure necessary may be as great as the final pressure put on the cement. Probably the most obstinate obstacle to breakdown is the mud cake on the sand; and since a porous formation is a factor of mud cake formation it can well be assumed that a good cake covers the face of gas and water sands. How effectively this cake is removed cannot be known and its incomplete removal may influence the squeeze job adversely. Pressures usually drop after the breakdown and this would indicate that there is some passageway for the slurry; but this offers no assurance that the entire face to be cemented has been cleaned of mud. In exceptional cases there has been no distinctive breakdown with the water since the pressure continues to rise while some water is being put away. When this happens it is best to start the cement and put away as much of it as possible.

That the mud cake is a definite obstacle to squeeze cementing has been demonstrated. In one well, for example, the formation could not be broken down at a pressure of 5000 p.s.i. A mud thinner was pumped in and, after being allowed to become effective, permitted breakdown at considerably less

pressure. While it has not become the practice to use any agent to react on the mud cake and the chemical used in this well was not actually a mud disintegrating agent, some research work is being done on this subject to determine whether or not better preparation of the hole might not insure better squeeze jobs.

Pressures ranging to above 5000 p.s.i. are used in squeeze cementing and the cement retainer is widely employed for the placement of the cement slurry. The retainer is set in the casing and two typical applications for squeeze cementing are illustrated in Fig. 7. The retainer on the left was used for recementing a wet casing job through holes gun-perforated just above the shoe. Attempts to cement around the shoe had failed but the squeeze as shown was successful in shutting off a heavy flow of water just below which the string had been landed. The job on the right was for squeezing off a water sand in open hole and the retainer was equipped with a tail pipe to discharge the slurry opposite the sand to be shut off.

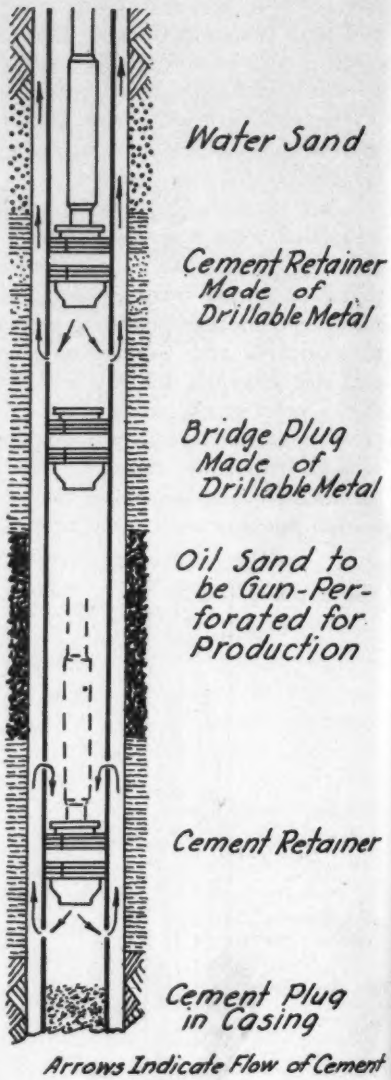
The cement retainer is so generally known that only a brief mention of its construction and operation is necessary. It consists essentially of a drillable packing assembly in the lower portion of which is a ball-type back-pressure valve. On the cylindrical body is a short rubber packing positioned between two sets of slips. The tool is run into the well on a string of drill pipe or tubing on the bottom of which is a circulation joint that permits bleeding off fluid preceding the cement and provides for circulation above the retainer at any time.

The retainer, run into the well with free passage through it, is tripped by hydraulic pressure applied to the surface after a tripping ball has been dropped into the running-in string and reaches a seat in the retainer. The ball back-pressure valve (which is kept inoperative while the tool is running into the hole) is released by further hydraulic pressure and circulation down through the retainer established. An upward strain taken on the tubing then sets the upper slips, releases the lower slips, forces these slips into setting position and compresses the packing rubber. Cement slurry is then pumped down the running-in string and out the bottom of the retainer to be forced around the shoe, through perforations in casing or into open hole below the shoe, as the case may be.

A new design of "removable cementer" adaptable to squeeze cementing has recently been introduced in California. This tool, illustrated in Fig. 8, is run in the hole on tubing or drill pipe and anchored in position in the casing or liner with slips located at the top of the tool. These slips have wickers to prevent upward movement since the pressure applied in squeeze cementing and breaking down the formation is from below and this pressure upward against the slips makes their action effective. The friction against the pipe is sufficient for preventing downward movement to an extent necessary for operation of the tool.

The packing element is forced out against the pipe by the application of pressure from below on a swab rubber placed below the packer. Between the packer and the swab rubber is a fluid seal as well as a steel sleeve through which the pressure on the swab rubber is transmitted to the packing rubber. With release of pressure after the job is completed, the packer elongates to approximately its original position and offers no interference while being pulled out.

Circulation through the tool is controlled by positioning the fluid ports in the inner barrel of the cementer. When running in, the fluid in the hole passes up through the inner barrel, out the fluid port in this barrel, up between the inner and outer barrels then out through a port in the outer barrel and up the annulus between the tubing and casing or liner. Upon reaching position


Water Sand
Cement Retainer Made of Drillable Metal
Bridge Plug Made of Drillable Metal
Oil Sand to be Gun-Perforated for Production
Cement Retainer
Cement Plug in Casing
Arrows Indicate Flow of Cement
Figure 9

in the well the slips are set and the inner barrel of the tool lowered to its lowest position. The slips are always in contact with the body and when pressure is applied are driven upward on slip body which is held in position by a sub on top of mandrel. Pump pressure is then applied to test the tool and the formation after which the inner barrel is raised to the by-pass position and fluid preceding the cement is by-passed to return up the hole. The inner barrel is reset at lower position to put away the cement.

After the job is completed the inner barrel is raised to the by-pass position and the excess cement pumped out by reverse circulation.

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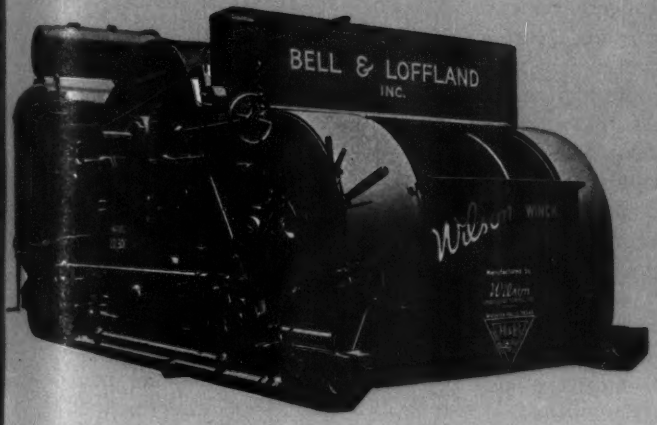
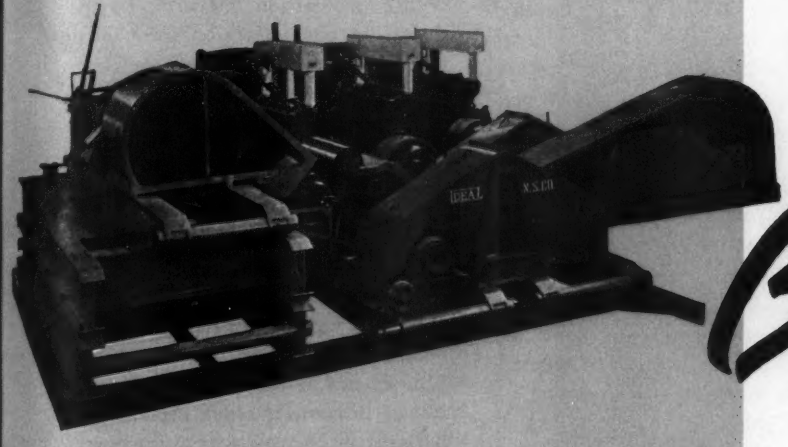


Wilson Giant Double Drum Standby Hoist with model G. A. K. U. Waukesha motor.



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The slips are then released by raising the inner barrel until the shoulder comes in contact with the slip body, raising this member and releasing the slips back to their neutral position. The tool is then pulled out of the hole.

The temperature, time element and mix should all be given the same attention in squeeze cementing as when performing casing jobs.[1] The mix, however, will vary with conditions encountered and it may be best to use a lighter slurry with some formations. Sometimes it will be advantageous to start the squeeze with a light slurry and decrease the water as the job progresses. At other times a heavy slurry can be used to secure the most satisfactory results. The type of cement, a slow set or quick set, should be selected to meet the conditions. With high pressures usually necessary for squeeze cementing there is a possibility that a denser set cement is likely to be secured since more water should be forced out of the effective deposit of slurry.

Every bit of subsurface data available should be studied when planning a squeeze job, especially if it is for repair work. The character of the offending formation to be cemented off and the presence of fluid flow from other sources will influence the job. The condition of the equipment in the hole and of the face of the formation cannot always be known but everything possible should be done to make the hole favorable for the cementing operation. In many cases the face of the formation to be cemented off may be contaminated with mud, sludge or other foreign matter; and when this is behind pipe and not subject to washing, the pressure alone must be relied upon to make the cement effective.

There is a difference of opinion as to the effect of cement on an oil sand when a water or gas sand is squeeze-cemented in open hole where the oil sand is exposed to the cement during the squeezing operation. Jobs have been reported where the water or gas has been shut off successfully with no harm to the oil production. Other operators have reported less desirable results. The character of the oil sand, the formation and the producing age of the well probably are factors influencing the results. It is generally admitted that cement will not seal off an oil sand as effectively as other formations but there is still a question as to the degree to which the oil bearing formation is affected. In the Gulf Coast fields the cementing off of gas sands to reduce gas/oil ratios and of water sands to shut off bottom water have been eminently successful in the presence of an open oil zone.

The reaction of an oil zone on the cement would influence the planning of a cement job where a number of zones are to be cemented off behind pipe for later perforation to secure production. The oil is going to have an effect on the cement passing through it to the zone above and greater assurance of an effective encasement of the pipe through the strata lying between productive zones will be obtained by staging the cement. This assures uncontaminated slurry being forced out of the pipe above each oil zone and eliminates the hazard of channels being started by the oil below. In procedures such as those followed in Montebello as described above, this is not important since recementing between the producing zones is contemplated.

Multiple Batch Cementing

The multiple batch method of cementing provides a means of placing the cement in a well in one extended operation in order to reach a final pressure that could not be otherwise attained except by several squeeze jobs or by the use of an excessive amount of cement. A cement retainer with its circulation joint is used for placement of the cement, the circulation joint being opened between batches to bleed out the fluid separating the batches of cement.

[1] "Cement and Conditions Affecting Cement," Califorina Oil World, Second Issue, July 1940.

After one batch of cement has been placed, the slurry in the retainer and just below it is displaced with clear water and the cement allowed to stand undisturbed until it has gained at least its initial set. This will vary with the setting time of the cement, the temperature and the mix. The next batch is then pumped in and the procedure repeated until the desired pressure has been obtained. The first batch fills some of the interstices or channels and succeeding batches either fill others or continue the plugging of those not completely filled by the first batch. The cement is allowed to take an initial set between batches since movement after the cement starts setting and before it becomes immobile will weaken it or make it completely ineffective.

Squeeze cementing of thief sands or formations with little or no pressure can usually be accomplished by using multiple batches. Sufficient cement sets close enough to the hole to give a resistance which makes possible the progressive increased plugging of passageways originally open to the slurry until the final batch may require considerable pressure for its placement.

This method has been used for recovering lost circulation and is often facilitated by the use of gel-cement[1] for the purpose. When shutting off bottom water where the flow of water is apt to dilute the slurry, the addition of prepared bentonite may also be distinctively advantageous. The gel-cement will not absorb water to any appreciable extent and thus, when placed under a pressure that is maintained until the cement has set, will probably give a denser cement. The dilution with formation water does not occur after the full volume of cement has been deposited but during the pumping in of the slurry and it is at this time that the gel-cement has the advantage of not taking up water from the sand since it will tend to force it back into the channels through which it has been reaching the bore of the well.

Plugging Back to Upper Production

In many wells where it is decided to plug back and produce from an upper formation which was cased off or passed up when drilling, there may be liner or casing left in the hole below the new zone. To make the plug below the sand effective this pipe should be cemented both inside and out when there is any chance of water from below coming up to injure the sand. Even if large perforations are made in the pipe below the sand it is generally advisible to squeeze the cement and make sure that all danger from water migration from below is eliminated. This is particularly true when a high pressure water zone is to be plugged off since the water will come up behind the pipe unless a good bond with the wall of the hole is provided.

Water sands above an upper zone to which a well is being plugged

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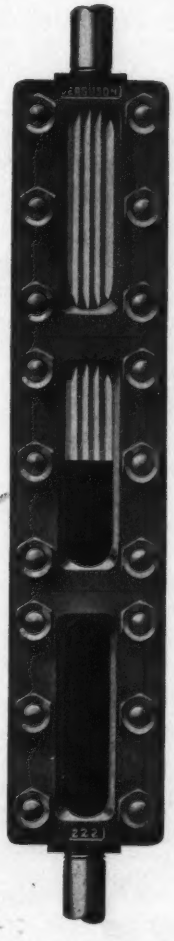

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also frequently have to be cemented off even when the productive zone itself has been protected by cement during the time it has been cased off. This is done by perforating below the water sand and squeezing the cement out the perforations and up through the channels in the old cement as shown in Fig. 9 which shows a typical example of plugging back a well in one of the Los Angeles Basin fields. In some cases the pipe is perforated above the water sand to provide for return of cement into the casing; but some operators object to this return since there is a possibility that all old channels in the cement will not be filled if the slurry has too easy egress out the top holes.

Repair Work

Repair work in oil wells generally presents problems peculiar to the individual well but in the great majority of cases is caused by water intrusion. Such work usually requires careful planning of the method to follow and study of subsurface conditions. Drilling and production records should be examined and geological data used to help determine the probable source of water. The actual point of entry of the water can be determined by a water-locating service and this point should be known before the cement job is planned. While other information may indicate where the water appears to enter the hole, there is so much chance of misinformation on water source that its point of entry should be checked carefully.

The preparation of the hole for cementing may have a great influence on the success of the job and every means should be taken to get the well in the best possible condition. Sometimes, however, little can be done in this regard for a repair job and greater reliance must be placed on the cement and the method used for its placement. Cement is now being used for such a variety of repair jobs that it is impossible to present any general methods or procedures. The selection of the cement and the mix must be governed by the conditions existing in the hole; and with ever deepening repair work these factors become more important.

Mortar and Concrete for Subsurface Operation

As brought out in a previous article[1], sand has been used with cement in a number of wells in California. The mortar has been successful for making a hard plug for side-tracking a fish, for straightening hole and similar operations. The mixture employed has ranged from 15 to 50 per cent of sand to cement and there have been more than a hundred jobs of this kind done during the past year.

On some of these jobs pea gravel has been used to make a concrete for this type of work. The volume of gravel was 20 per cent of that of the cement and in one well was pumped through 4-in. drill pipe to a depth of 6500 feet.

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Europe Facing Oil Shortage

The amount of oil used in the war is an unknown quantity. That the amount is enormous is certain. A report from London is to the effect that Europe is facing a 9,000,000 ton oil shortage this year. This is equivalent to 54,000,000 barrels. Discrepancy between Europe's productive capacity and her needs is made clear in the following potential supply figures prepared by the Petroleum Press Service: Germany, including Austria, Czecho-Slovakia and Poland, 5,000,000 tons; Roumania's exportable surplus, 500,000 tons; Italy, including Albania, 370,000 tons; France, occupied and unoccupied, 250,000 tons, Estonia, 100,000 tons; and Belgium and Netherlands, 40,000 tons. The prewar annual consumption was: Germany and Italy, 9,000,000 tons; occupied France, Netherlands, Belgium, Denmark and Norway, 7,500,000 tons; and Sweden, Switzerland, Greece, Finland, Baltic States, Yugoslavia and Bulgaria, 2,500,000 tons. The total pre-war consumption was 19,000,000 tons, the present potential supply, 10,260,000 tons.

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Natural Gasoline Cuts and Their Relation to Aviation Gasoline

C. N. G. A. AUGUST MEETING

By Karl Korpi

Presented at meeting of California Natural Gasoline Assn., August 7, 1940. Pacific Coast Club, Long Beach, Calif.

Natural gasoline has always been an important source of aircraft fuels because of its volatility, knock rating and good lead susceptibility. Even though the present trend in aviation gasolines is toward octane numbers that cannot be attained by natural gasoline, it still plays an important part as a source of raw materials and as a blending stock in the production of all grades of high antiknock rating fuels, including some of the super-octane number variety.

Although natural gasoline contains many individual hydrocarbons of high octane number, in rather low concentration, it is not profitable or even possible in some cases to separate them by careful distillation from low knock rating compounds, especially those components which are used in the higher boiling ranges of aviation gasoline, where good knock rating is required. There are sufficient low octane components present so that the highest antiknock value for a suitable fuel that can be obtained from natural stocks is 70-75 clear octane or 92 leaded iso-octane number. All higher octane number fuels are blends prepared from synthetic iso-octane and alkylation gasolines[1], both of which require the addition of low boiling materials, such as isopentane, neohexane or natural gasoline heart fractions to give satisfactory carburetion, i.e., a balanced Engler distillation curve.

Types of High Octane Number Aviation Fuels

There are four types of aviation gasoline with knock exceeding 90 iso-octane that can be produced by suitable blends of "alkymer"[1a] aviation, isopentane, iso-octane, neohexane and natural gasoline heart cuts.

These are characterized by the following specifications:

1. 92 octane number (Army) with not more than 3.4 ml. of tetraethyl lead (T.E. L.)/gallon.

2. 92 octane number without lead.

3. 100 octane number (Army) with not more than 3 ml. T.E.L./gallon.

4. Octane numbers in excess of 100 iso-octane and equivalent to iso-octane plus 1.5 (110 octane) and 3.0 ml. T.E.L./gallon (115 octane).

All of these fuels must have vapor presstures not to exceed 7 lb./sq. in. at 100°F. and Engler distillations not above 167°/F. at the 10% point, 212° or 221°F. at the 50% point (depending on the fuel), and 275°F. at the 90% point.

The data summarized in appended Table 1 present properties, such as knock rating, vapor pressure and boiling range, of natural and synthetic stocks that are now available. From these basic materials it is possible to construct any of the present day slow-burning aviation gasolines. It will be seen in the following paragraphs what an important part natural gasoline plays in these new fuels.

Leaded 92 Octane Number Fuel

This particular gasoline can be made entirely from natural gasoline by separation of a suitable heart cut that satisfies the Engler distillation curve and has a clear knock rating sufficiently high to give 92 octane number (Army) with not more than 3.4 ml. of T.E.L./gal. With a good lead response a clear value of 71-75 iso-octane number on the heart fraction should result in the desired leaded Army rating.
with iso-octane or alkymer aviation, but it would be uneconomical to utilize these high cost synthetic materials in the manufacture of fuels easily obtained from cheaper sources.

Clear 92 Octane Number Fuel

The preparation of this fuel can be realized from either iso-octane or alkymer by the addition of carefully selected natural gasoline fractions.

Iso-octane Blends for 92 Octane

Referring to the data in Table 1, it is calculated that approximately 25 to 32% of natural gasoline heart cut (depending on the knock rating) may be present in the final iso-octane blend and still have a nondetonating value of 92 clear. The boiling range of the heart cut must be

This fuel can also be made from blends chosen so as to satisfy the final Engler and vapor pressure specifications. Since the manufacture of iso-octane consumes no natural gasoline[2] the total amount of natural stock present in the blend from this source remains at 25-32% by volume.

Alkymer Aviation Blends for 92 Octane

The preparation of 92 clear octane number with alkymer aviation is somewhat more difficult than with iso-octane. Reference to Table 1 reveals that only those alkymers synthesized from butylenes or isobutylene, octylenes or di-isobutylene have high enough intrinsic knock rating to satisfy the requirement. It is apparent that the addition of natural gasoline fraction to the alkymer aviation cannot be tolerated without loss of octane, except for isopentane, which must be added to make the fuel meet the Engler specifications. Since isopentane is obtained by careful fractionation of natural gasoline, which contains the low octane number n-pentane boiling just 16°-18°F. above the isoparaffin, exceptional columns must be used to keep the concentration of n-pentane in the overhead at a minimum so that the highest possible antiknock can be realized for this fraction.

The isopentane may be added to the extent of 10% of the final blend. This isopentane, however, does not represent the only hydrocarbon from natural stocks that has gone into the fuel. In the previous paper[3], it was demonstrated how isobutane from natural gasoline was employed in large quantities in the synthesis of alkymer gasoline. Approximately one gallon of isobutane and one gallon of olefin combine in the presence of sulfuric acid to give somewhat less than two gallons of alkymer. It is obvious, therefore, that alkymer aviation already has about 50% of a natural stock in it. When this is considered it is seen that 55% of the final 92 clear knock rating fuel has been derived from natural gasoline.

Leaded 100 Octane Number Fuels

Leaded 100 octane number fuels can be made from the same synthetic base materials, iso-octane and alkymer, as the 92 clear octane. In this case, however, the permissible maximum of 3 ml. T.E. L./gallon allows the blending of an appreciable quantity of natural gasoline heart cuts into the fuel. The excellent lead susceptibility of iso-octane and alkymer and the good lead response of natural gasoline (see appended Table 2) permits a clear octane number as low as 82-84 in the final blend before leading to 100 iso-octane with the specified amount of tetraethyl lead.

Iso-octane Blends for 100 Octane

The amount of natural gasoline used in the preparation of leaded 100 octane blends from iso-octane is approximately

[1] Hereafter called "alkymer" gasoline.
[1a] "Alkymer" is a registered trade mark.

[2] Iso-octane is made by the polymerization to octylenes of butylenes, obtained from cracking still gases followed by hydrogenation and fractionation.

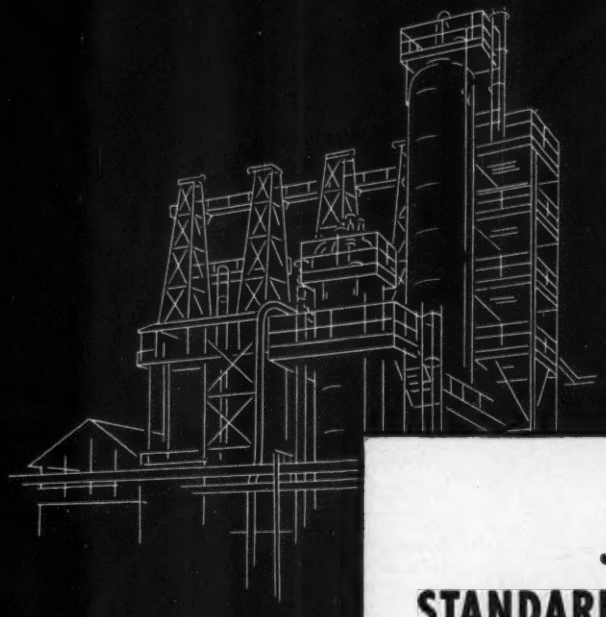

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TABLE 1
SOME CHARACTERISTICS OF SYNTHETIC AND NATURAL HYDROCARBONS USED IN PRODUCTION OF HIGH OCTANE NUMBER AVIATION FUELS

Substance	Knock Rating ASTM Motor	Reid Vapor Pressure lb./sq.in. at at 100°F. (approx.)	Boiling Range of Fraction, °F. (approximate) Init.-	10%	50%	90%	Max.
Natural Gasoline Fractions							
Isobutane	99	70	...	14	14	14	...
n-Butane	90	50	...	32	32	32	...
Isopentane[1]	90-93	20	...	82	82	82	...
n-Pentane[2]	66	16	...	98	98	98	...
n-Hexane[2]	30	5	...	156	156	156	...
Natural Gasoline	72	9.2	104	...	...	...	339
Natural Gasoline	69	7.2	112	...	...	...	324
Natural Gasoline heart cut	74-75	10	80	...	...	...	205
Natural Gasoline heart cut	74	..	128	...	...	...	179
Natural Gasoline heart cut	72	..	161	...	...	...	224
Natural Gasoline heart cut	67	..	206	...	...	...	256
Natural Gasoline heart cut	73.5	7.0	124	...	...	...	206
Synthetic Materials							
Iso-octane	100	< 2	...	210	210	210	...
Neohexane[2]	94	10	...	122	122	122	...
Alkymer aviations made from							
Propylene	87	2-3	...	150-160	190-200	260-270	...
Butylenes	90-94[4]	2-3	...	170-180	212-220	260-270	...
Isobutylene	95-98	2-3	...	170-180	212-220	260-270	...
Pentenes	85-87	2-3	...	180-190	215-230	270-280	...
Selected pentenes (isopentenes)	90	2-3	...	180-190	215-230	270-280	...
Octylenes	90-92	2-3	...	170-180	212-220	260-270	...
Di-isobutylene	93-95	2-3	...	170-180	212-220	260-270	...
Polymer gasoline	81-83	2-3	...	160-170	200-210	250-270	...

[1]Present in natural gasoline to about 10-15% by volume.
[2]Present in natural gasoline but undesirable because of low octane number.
[3]Made by alkylation of ethylene and isobutane by Phillips Petroleum Company.
May also be present in isohexanes fraction of alkymer which has a 90-92 octane number.
[4]Depends upon quantity of isobutylene present in butylene feed.

constant at about 60% by volume, depending only on the octane number of the heart fraction employed. In other words 60% of natural gasoline and 40% of iso-octane have a clear knock rating of 82-84 which with 3 ml. T.E.L./gallon yields the desired fuel.

Alkymer Blends for 100 Octane

The amount of natural gasoline that can be employed in alkymer blends for 100 octane fuel depends upon the knock rating of the alkymer aviation used which in turn depends upon the olefin utilized in the manufacture of this synthetic material. Examination of Table 1 shows that alkymer made from polymer gasoline cannot tolerate the blending of any natural gasoline as the clear knock rating is already in the critical minimum range of 82-84 without lead. Alkymer made from propylene or pentenes permits the use of 20-25% natural stock in the final fuel. The alkymers made from butylenes, selected pentenes and octylenes allow a concentration of 35 to 45% of natural gasoline in the final blend. The isobutylene and di-isobutylene alkymers approach iso-octane in the amount of natural that may be used in the blend, 50-60% being the maximum concentration present in producing 100 octane number fuel.

Clear 100 Octane Number Fuels

At the present time it is not possible to prepare clear 100 octane blended fuels satisfying the existing distillation specifications either from iso-octane or alkymer because there are no hydrocarbons available boiling below iso-octane that possess the required knock rating. The nearest approach to 100 octane gasolines are blends of 5% isopentane, 5% neohexane, and 90% iso-octane or 10% isopentane-(or neohexane) and 90% iso-octane, either one of which has a knock rating of 99-99.4. Blends of 10% isopentane, 10% neohexane and 80% iso-octane or 20% of isopentane (or neohexane) and 80% iso-octane can attain 98.5-99 octane number.

Super-Octane Number Fuels

Super-octane number fuels are those gasolines which have knock ratings greater than that of 100% iso-octane and are equivalent to iso-octane plus some given amount of lead tetraethyl/gallon not exceeding 6 ml. These gasolines are not in general use, are less abundant and cost more to produce than 100 octane fuels because natural gasoline cannot be added as a blending stock.

The 92 clear octane fuel described above falls into the super-octane classification when more lead tetraethyl is added than is necessary to give 100 octane. Usually 0.5 to 1.0 ml. T.E.L./gallon is all that is required for 100 octane from 92 clear. The addition of 3-6 ml. T.E.L./gallon is probably equivalent in knock rating to iso-octane plus 1.5 ml. lead or about 110 octane.

Iso-octane Blends for Super-Octane

The blends described under clear 100 octane number fuels fall under the super-octane classification when lead is added. These blends have a good lead response, and anti-detonation values ranging from 115-119 octane number may be possible when 3 to 6 ml. T.E.L./gallon is added to the fuel.

Alkymer Blends for Super-Octane

Octane numbers in the neighborhood of 110 are probably the maximum knock ratings that can be obtained from alkymer aviation unless the alkymer is prepared from isobutylene or di-isobutylene, in which case the maximum anti-detonation values approach those of iso-octane blends with pure isopentane and/or neohexane. The natural gasoline used as blending material in these fuels is limited to the amount of isopentane consumed in either the iso-octane or alkymer blends, which usually does not exceed 10% by volume. It is worthy of note that isopentane may become of greater importance as a component of super-octane fuel than as a constituent of 100 octane blends which are more easily realized.

The preparation of fuels discussed in the preceding paragraphs are summarized in appended Table 3 in which are tabulated the clear octane values, the leaded octane numbers, the compositions of the final gasolines and the quantity of natural gasoline that has been required both

TABLE 2
LEAD SUSCEPTIBILITY SLOPE OF VARIOUS SYNTHETIC AND NATURAL HYDROCARBONS

Hydrocarbon	Clear Knock Rating ASTM Motor	Octane Number with 1 ml. TEL/gal.	Octane Number with 3 ml. TEL/gal.	Lead Susceptibility Slope
n-Heptane	0	22.2	44.4	1.80 (experimental)
Neohexane[2]	94	....	114-115	4-4.5 (estimated)
Iso-octane[1] (25% in n-heptane)	25	44.6	61.8	4.12 (estimated)
Iso-octane[1] (40% in n-heptane)	40	58.0	71.4	3.85 (estimated)
Iso-octane[1] (70% in n-heptane)	70	83.9	90.6	3.09 (estimated)
Iso-octane[1] (85% in n-heptane)	85	97.0	102.3	3.04 (estimated)
Alkymer aviation gasoline	88	100	106 (est.)	3.4 (experimental)
Alkymer aviation gasoline	89	100	<107 (est.)	3.1 (experimental)
Alkymer aviation gasoline	90	100	<108 (est.)	2.75 (experimental)
Alkymer aviation gasoline	92	<102 (est.)	<110 (est.)	2.1 (experimental)
Alkymer aviation gasoline	95	<105 (est.)	112-114 (est.)	.....
NGHC = Natural gasoline heart cut	71	....	92	2.58 (experimental)
NGHC = Natural gasoline heart cut	72	....	92	2.46 (experimental)
NGHC = Natural gasoline heart cut	73	....	92	2.34 (experimental)
NGHC = Natural gasoline heart cut	74	....	92	2.20 (experimental)
NGHC = Natural gasoline heart cut	75	....	92	2.06 (experimental)
Iso-octane 40% — NGHC 60%	83-84	....	100	2.73-2.56 (experimental)
Alkymer + NGHC	82	....	100	2.90 (experimental)
Alkymer + NGHC	83	....	100	2.73 (experimental)
Alkymer + NGHC	84	....	100	2.56 (experimental)
Alkymer + NGHC	85	....	100	2.38 (experimental)
Iso-octane 52% — NGHC 48%	92	100	110 (est.)	2.15 (experimental)

[1]Values taken from Oil and Gas Journal, page 145, March 31, 1938.
[2]Refiner, Nov., 1939, page 108.

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   Example: In Corpus Christi area, Texas—
   Initial capacity: 55 million cu. ft. of gas per day.
   Separation Pressure: 1,200 lbs.
   Input Pressure: 2,800 lbs.
   Production: 51,000 gals. per day of stabilized distillate.

2. **Recovery by high pressure Absorption Process.**
   Example: In Corpus Christi area, Texas—
   Largest high pressure Absorption Plant—
   Capacity: 128 million cu. ft. of gas per day (designed for ultimate capacity of 140 million cu. ft.
   Absorber Operating Pressure: Up to 1,500 lbs. per sq. in.
   Compressors operating at 1,350 lbs. suction, 2,000 lbs. to 2,200 lbs. discharge.
   Production: 105,000 gals. per day motor gasoline, 6,000 gals. per day of kerosene.
   (Another plant just completed, in Corpus Christi area—same operating conditions, but two-thirds the capacity.)

3. **Recovery through low temperature, using Mechanical Refrigeration.**
   Example: In Cayuga Field, Texas—
   Capacity: 11,800,000 cu. ft. of gas per day.
   Separation Pressure: 1,200 lbs.
   Input Pressure: 1,600 lbs.
   Production: 6,500 gals. per day of stabilized distillate.

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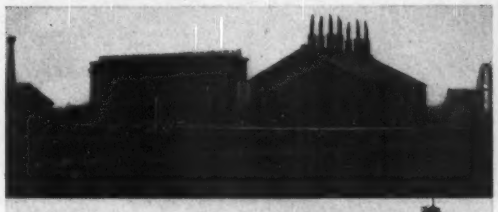

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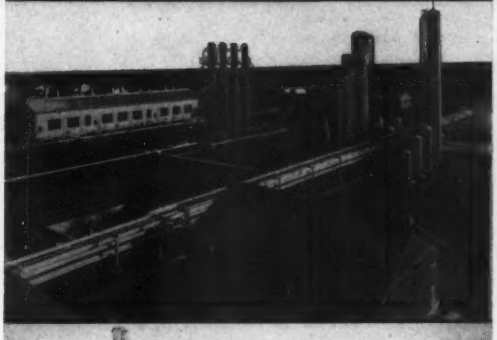

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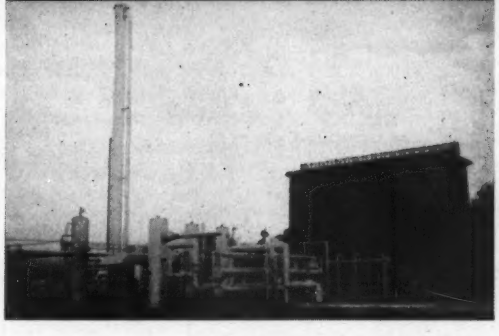

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TABLE 3

THE UTILIZATION OF NATURAL GASOLINE IN PRODUCING HIGH OCTANE NUMBER AVIATION FUELS

Clear Octane Number of Blend	Leaded Octane Number of Fuel Desired	ml. TEL/gal.	Composition of Aviation Blend Required for Desired Fuel						Total Natural Gasoline Fraction in Final Blend[1] % by Vol.
			Iso-octane % by Vol.	Alkymer Aviation Fraction		Selected Natural Gasoline Heart Cut % by Vol.	Iso-Pentane % by Vol.	Neo-hexane % by Vol.	
				Type Used Olefin Feed	% by Vol.				
72-75	92	3.4	..	.....	..	100	..	..	100.0
92	..	0	68-75	.....	..	25-32	..	..	25-32
92	..	0	..	Butylene	90	..	10	..	58
82-84	100	3.0	40	.....	..	60	..	..	60
82-84	100	...	..	Propylene	78	22	..	..	67
82-84	100	3.0	..	Butylene	56	44	..	..	73
82-84	100	3.0	..	Isobutene	41-48	52-59	..	..	76-80
82-84	100	3.0	..	Pentenes	78-93	7-22	..	..	49-57
82-84	100	3.0	..	Selected pentenes	64	36	..	..	65
82-84	100	3.0	..	Octylenes	56-64	36-44	..	..	69-72
82-84	100	3.0	..	Di-isobutylene	48	52	..	..	77
82-84	100	3.0	..	Polymer gasoline	90	..	10	..	60
92-93	110[2]	3.0-6.0	..	Butylene	80	..	10	10	58
95	110[2]	3.0	..	Isobutylene	80	..	10	10	58
92.2	110[2]	3.0-6.0	..	Butylene	80	..	20	..	61
98-98.7	115[3]	3.0-6.0	80	.....	..	..	10	10	17

[1]Includes the isobutane of synthesis and any isopentane used in blending.

[2]Estimated octane number equivalent to iso-octane +1.5 ml. TEL/gal. Concentrations of isopentane and/or neohexane may be varied over rather wide limits in the last 4 blends provided the vapor pressure is under 7 lb.

[3]Estimated octane number equivalent to iso-octane +3.0 ml. TEL/gal.

as a raw material and as a blending stock in producing the fuel.

Octane Number Trends

After reviewing this upward trend in octane number, the following questions come to mind. Where does the upper limit in knock rating lie? Are there iso-paraffin compounds with higher knock rating than iso-octane? At the present time it does not seem possible to go above the equivalent of iso-octane plus 6 ml. T.E.L./gallon or approximately 119-120 octane number with the available fuels. It would be exceedingly difficult to prepare a balanced Engler distillation for fuels with knock ratings higher than 115-119 octane number because there are no pure hydrocarbons boiling below iso-octane that equal 100% iso-octane in detonation characteristics, except perhaps triptane. The latter compound, an isoheptane (2, 2, 3 trimethyl butane), is said to surpass iso-octane and may even be as high as 150 iso-octane number. It is rather doubtful, however, whether the pure compound, which has so far resisted attempts to prepare it in commercial quantities, exceeds iso-octane by more than a few octane numbers. However, triptane and iso-octane blends would still require a third, lower-boiling, component of equivalent detonation rating in order to pass the 10% point in the distillation curve. Isopentane, neohexane or 2, 3 dimethyl are the only compounds known at present boiling below 167°F. that even approach iso-octane in slow-burning properties in the internal combustion motor. Nothing is known of the burning characteristics of the methylated cyclopropane and cyclobutane derivatives. They may satisfy the demand for the high knock rating, low-boiling hydrocarbons that are required for super fuels. At the present time, however, the maximum knock rating for a balanced gasoline appears to be 115-119 octane number with not more than 6 ml. of lead/gallon.

Future Possibilities for Natural Gasoline in High Octane Fuels

The possibilities for future increased utilization of natural gasoline in the production of non-detonating aircraft fuels are somewhat limited and may be briefly summarized in the following outline in which natural stocks serve only as raw materials.

1. Isolation of individual high knock rating hydrocarbons by careful fractionation or other means from natural gasoline, e.g., isopentane, cyclopentane, etc.

2. Dehydrogenation of n-butane to butylenes for use as alkylation plant olefins.

3. Isomerization of n-butane and n-pentane to isobutane and isopentane, respectively.

Conclusions

In conclusion it may be stated that natural gasoline is essential in the production of aviation gasolines because:

1. It serves as a good blending stock.

2. It aids in meeting distillation specifications.

3. It is the source of isobutane for alkylation.

4. It is the source of isopentane for blending.

5. It increases the supply of 100 octane fuel appreciably.

6. It reduces the cost of manufacture of 100 octane fuel.

[3]Refiner, pages 63-70, December, 1939.

Aviation Gasoline Output 900,000 Bbls. Per Month

Production of aviation gasoline in the United States has averaged 900,000 barrels a month, or about 60 per cent of capacity of the refineries, since October 1939, the first month for which figures are available, according to the U. S. Bureau of Mines. Exports have increased steadily in recent months, but the total for the first five months of the year, 1,246,000 barrels, was 42 per cent lower than it was in the corresponding period last year. Domestic demand has fluctuated materially, but has averaged about 400,000 barrels a month. This is about one third more than the average of total exports. Cumulative total exports for the first five months of the year indicates that 66 per cent went to Europe, 13 per cent to western hemisphere, 11 per cent to Asia, Australia, and Africa, and 10 per cent to the non-contiguous territories of the United States.

Natural Gasoline Plants In the United States

Indications that the concentration of natural gasoline manufacture in fewer establishments, which has been in progress for more than 10 years, has lost much of its impetus is evident in the biennial survey of the Bureau of Mines, United States Department of the Interior. This survey shows that there were 729 plants at the beginning of 1940, or only 12 fewer than on January 1, 1938. Of the number, 671 were operating and 58 shut down. The total daily capacity of the plants was 11,662,000 gallons, the highest ever recorded. The share of Texas in operating capacity increased and that of both California and Oklahoma decreased. These three states had 84 per cent of the total operating capacity on both January 1, 1938, and January 1, 1940. The principal change concerning types of plants was the appearance of recycling plants. There are supposed to be about a score of such plants (all in Texas), but only 10 of 246,000 gallons capacity were so designated in the returns for January 1, 1940.

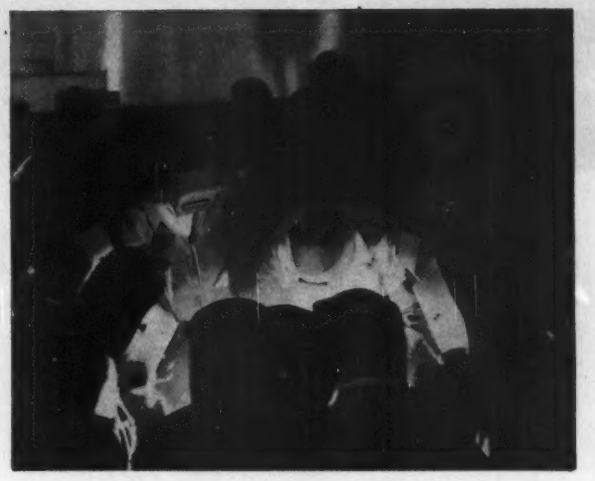
REVIEW OF THE YEAR 1939

Supplementing the regular monthly report, the following yearly figures are presented:

Crude oil production for 1939 totaled 224,354,048 barrels, a decrease of 25,395,198 barrels under 1938 production. The daily average for the year was 614,669 barrels, compared with 684,244 for the previous year, a decrease of 69,575 barrels per day. 525 wells were abandoned during the year. Of these, 268 were abandoned oil producers and 6 were gas wells; 246 were abandoned while drilling for oil and 5 while drilling for gas.

Below is shown the total production for the year and the daily average, also the oil well completions and initial daily output for the year, for each oilfield in the State:

	Total 1939 Production	Daily Average	Wells Completed	Daily Initial Output
Group No. 1				
Arvin	445,676	1,221	14	23,777
Belridge—North	4,361,453	11,949	14	7,959
Belridge—South	419,764	1,150	...	.....
Canal	1,854,658	5,081	16	25,385
Canfield Ranch	21,633	59	...	.....
Coalinga	5,730,573	15,700	58	137,204
Cole's Levee	336,018	920	13	10,397
Edison	837,884	2,296	5	365
Elk Hills	3,829,940	10,493	2	197
Fruitvale	2,376,587	6,511	9	1,140
Greeley	811,206	2,222	11	35,776
Kern River	4,132,754	11,323	30	301
Kettleman Middle Dome	8,829	24	...	.....
Kettleman North Dome	19,559,177	53,587	40	83,824
Lost Hills	1,222,238	3,349	1	69
McKittrick	1,325,929	3,633	4	229
Midway-Sunset	18,960,497	51,947	18	1,673
Mountain View	2,983,263	8,173	2	220
Mount Poso	4,314,314	11,820	12	3,081
Paloma	23,207	64	1	2,246
Rio Bravo	2,875,405	7,878	14	31,250
Round Mountain	3,527,715	9,665	12	2,051
Strand	134,508	369	6	15,737
Ten Section	3,246,815	8,895	11	29,978
Tupman	190,401	522	4	5,065
Wasco	402,238	1,102	4	19,047
Wheeler Ridge	124,520	341	1	104
Group No. 2				
Capitan	876,022	2,400	...	.....
Elwood	1,545,512	4,234	...	.....
Rincon	1,237,717	3,391	6	1,969
San Miguelito	952,079	2,609	4	4,574
Santa Barbara	111,084	304	3	244
Santa Maria	6,304,734	17,273	16	34,066
Summerland	10,286	28	...	.....
Ventura Avenue	12,935,150	35,439	36	51,652
Ventura-Newhall	2,317,018	6,348	17	8,479
Watsonville	10,950	30	...	.....
Group No. 3				
Brea-Olinda	2,062,951	5,652	2	235
Coyote—East	941,883	2,580	3	989
Coyote—West	3,070,941	8,413	3	1,609
Domingues	7,130,594	19,536	16	13,701
El Segundo	1,168,183	3,201	...	.....
Huntington Beach	9,983,160	27,351	23	7,495
Inglewood	4,605,242	12,617	...	.....
Lawndale	19,175	53	...	.....
Long Beach	17,003,310	46,584	9	1,174
Los Angeles-Salt Lake	189,804	520	...	.....
Montebello	7,454,768	20,424	128	86,937
Playa Del Rey	1,800,533	4,933	1	90
Potrero	409,897	1,123	3	776
Richfield	3,134,283	8,587	2	75
Rosecrans	4,459,363	12,218	31	10,690
Santa Fe Springs	10,050,530	27,536	1	394
Seal Beach	2,640,534	7,234	2	309
Torrance	6,417,738	17,583	70	25,667
Whittier	353,011	967	...	.....
Wilmington	31,100,394	85,207	174	86,429
Group No. 4—Gas Fields				
Buena Vista Lake	.....	.....	...	.....
Buttonwillow	.....	.....	...	.....
Chowchilla	.....	.....	...	.....
Delano	.....	.....	10	Gas
Dudley Ridge	.....	.....	...	.....
Fairfield Knolls	.....	.....	1	Gas
Goleta	.....	.....	...	.....
Marysville Buttes	.....	.....	1	Gas
McDonald Island	.....	.....	.....	.....
Rio Vista	.....	.....	1	Gas
Semi-Tropic	.....	.....	...	.....
Tracy	.....	.....	...	.....
TOTAL	224,354,048	614,669	885	774,629



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LAUGH THIS OFF

There is a lot of talk these days about freedom of speech, but don't pay any attention. Freedom of speech is nothing in the world but just saying anything you like to a guy you know you can lick.

And on the general subject of economics, **Roy Hitchcock** offers the following definitions to-wit: A recession is a period when you have to tighten your belt; a depression is a time when you have no belt to tighten; and when you lose your pants that is a panic.

Joe Scanlon, one of our better informed correspondents, next kicks in with the strange story of a new Fillmore daddy who was sent to the drugstore for a dozen paper diapers. After wrapping them up the clerk said, "That will be one dollar and three cents for tax". "Oh", replied the young pappy, "We don't need no tacks—we use safety pins."

Joe declares this lad couldn't be prouder of his baby if it was a bird dog. They are working on the kid now with a watering can to get him broken in for the christening.

All of which recalls **Phil Schnell's** story of the oil man who was pinched for doing eighty miles in a fifteen mile zone. He was forgiven, however, when he explained to the judge that he was taking his wife back to her mother.

And it has little to do with the subject, but if there wasn't so much change in women's fashions there would be more change in men's pockets.

Whereupon the first rousty barks at the second rousty in the boarding house dining room, "Put your hand over your mouth when you yawn". Replies the second one, scornfully, "Yeah—and get bit. Not a chance".

Up to **Ron Smith** the other day came a total stranger saying, "I understand you need a man in the research department". "That's right", agreed Ron. "Well", continued the queer one, "I just came up to tell you I'm not interested".

On the other hand, **Bill Welch** tells about a pumper who became pretty good at bird imitations. He was arrested a few nights ago for doing a little robbin.

His alibi, incidentally, was that he had been working too hard and was tired. So the Judge sent him up the river for a stretch.

And says the blonde to the visiting rousty, "If you kiss me again, I'll scream for my mother when she comes home from the movie show".

Now jumping from the meticulous to the ridiculous, or something, **John McLeod** claims to have heard two oil men discourse in the following illuminating terms: Says the first one, "Let's ditch the weekly sales meeting". Replies the second one, "Not on your tintype, I need the sleep".

Roy McLaughlin, at this stage and in this manner defines the two extremities of hopefulness: An optimist looks at his glass and with a smile notes that it is half full. A pessimist looks at his and growls because it is half empty.

Showing, of course that it is all in the point of view. You may be superstitious enough to believe that a rabbit's foot in your pocket means good luck, but we doubt if the rabbit would agree with you.

Be that as it may, **Ken Remy** walked up to the hotel clerk and inquired, "What are your rates?" "Two dollars to seven", was the answer, and Ken chortled, "Fine I'm leaving at six".

And **George Thompson** recites the case of the Scot who played regularly on the Carnoustie golf links. There was a small stream that trickled across the fairway at the fourth hole, and always as he addressed the ball be murmured caressingly, "Noo——I want ye to fly ower the nice wee brook". After his ball landed in it, he always shrieked, "Blankety blank blank, it's in that bloody sewer again".

With which few remarks we leave you to your own devices. Remember, you patrons of the street railway, that strap hanging is a long standing complaint.

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Field Development

San Joaquin Valley

Coles Levee Still Busiest Valley Field

On the flatlands in the South Central San Joaquin Valley, Coles Levee still holds its place as the busiest field north of the Tehachapis. With 19 strings at work, 6 rigs standing ready for tools and foundations being poured for several more, the work is being done in an area approximately four by two and a half miles square. Within the area are already nearly fifty good wells producing from the Stevens oil sands. Held in large blocks of acreage by only four major operators, the field is being developed in accordance with the best conservation practices.

Typical of the wells in the area is Richfield Oil Corp.'s KCL No. A-36-28 which was finished on contract by Bell & Loffland for a 1400 bbl. rate flow of 30 gravity clean oil.

Find New Production In Mount Poso Area

Dwight G. Vedder & Signal Oil and Gas Co. found a new producing area in the Mount Poso area since V-S-Glide No. 1 is completing on the pump after bailing clean.

Located near the south quarter corner of sec. 29,27-28 the well is adjacent to Shell Oil Co.'s Glide No. 1 which drilled to a barren 2508 ft. and Glide No. 58 which was abandoned in gray sand at 2321 ft. Both previous tries were abandoned in the Vedder, with only No. 1 showing oil sand. This well cored poorly saturated sands from 2298 to 2335 ft.

The current well topped the productive Vedder at 2300 ft. which continued to bottom at 2314 ft. Casing is cemented at 2297 ft. and a 6⅝-in. perforated liner is landed on bottom.

Stepping out to a location near the north quarter corner of sec. 11,26-27, Crestmont Oil Co. has built rig for Smith No. 1. Located several miles northwest of Mount Poso area production, the well is a little more than a quater of a mile east of Smith No. 1 which Superior Oil Co. abandoned at 3446 ft. in granite during 1927. The old well found the Vedder near 2485 ft., Walker at 2965 ft. and encountered the granite at 3414 ft.

At the south edge of the field A. T. Yeager's Murdock No. 3 is redrilled to 1660 ft. and casing will be set to test Vedder sands. Drilled against a fault on the west line of sec. 34,27-28 the well was once bottomed at 1680 ft. in gray Vedder sand found at 1659 ft. Apparently feeling that the well was on the wrong side of the fault, since Vanguard Oil Co. produces from Vedder sands across the section line, the well was plugged and redrilled from 650 ft. in an effort to drill through the hade and find saturated sands.

Grapevine Test Well Sets Protective Pipe

Richfield Oil Corp., in an effort to head off stuck drill pipe, which is a dangerous hazard in the Grapevine area, has cemented a protective string of 9⅝-in. casing at 6968 ft. in Tejon Ranch No. 1. Located southeast of the small spot of Grapevine production, in sec. 2,10-19, the well is bottomed in sand at 7023 ft. An electric log run prior to setting pipe disclosed that the hard basalt recently

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
	Fresno County				
Cantua Creek	The Texas Co., Everding	1	24, 17-15	1125	Drilling
Coalinga	Lewis, C. H.	1	18, 21-15	2298	Idle
	Section 30 Oil Co.	8	30, 19-15	1122	Redrilling
	Tide Water Assoc. Oil Co., Guardian	23	2, 20-15	3710	Drilling
Jacalitos Hills	Continental Oil Co., Kreyenhagen	1	4, 22-16	8771	Drilling
Mendota	Jergins Oil Co., Cheney Ranch	1	29, 14-13	9345	Idle
	Kern County				
Belridge—South	DeLanty & Sutton, Trustees	1	28, 28-22	2848	Drilling
	Santa Mora Oil Co.	1	10, 28-20		Material
Cantil Area	Red Rock Oil Co., Red Rock	1	13, 30-37	1900	Drilling
Devil's Den	Seaboard Oil Co., Beer	66	17, 26-19	5904	Drilling
	Trigg, H. C.	1	11, 25-18	693	May test
	Trigg, H. C.	2	11, 11-11	250	Drilling
Edison	Goodrum & Vincent, Inc., S.P.	6	31, 29-30	266	Drilling
Grapevine	Kern Line Oil Co.	1	19, 11-19	2910	Drilling
	Richfield Oil Corp., Tejon Ranch	1	2, 10-19	7023	Stdg. cemented
Mt. Poso	Crestmont Oil Co., Smith	1	11, 26-27		Rig
	Signal Oil & Gas Co., c/o Dwight G. Vedder, V-S. Glide	1	29, 27-28	2314	Completing
Round Mountain	Goody, F. D., Olcese	9-9	9, 28-29	2023	Abandoned
	Spartan Drlg. Co., Hiatt	1	32, 28-29	2085	Drilling
	Trico Oil & Gas Co., Coffee	2	8, 28-29	1122	Drilling
Semitropic	North Kern Oil Co., Sawyer	1	16, 25-22	6620	Rig removed
Shale Hills	Scotia Exploration Co., Abbott	1	7, 27-19	2047	Idle
Wheeler Ridge	Richfield Oil Corp. KCL	2	28, 11-20	6445	Drilling
	Tulare County				
Trico	Tide Water Assoc. Oil., Daniels	35	22, 24-23	11728	Plugged 3134

passed through extended from 5450 to 6450 ft.

North of the Grapevine, near the center of sec. 19,11-19, Kern Line Oil Co. is digging in Chanac near 2800 ft. This play is an attempt to prove a structure which was electrically determined late in 1939. Objective sands are thought to range from 5500 to 6000 ft.

Round Mountain Tests Yet Active

Moving a little more than a half mile north, Trico Oil & Gas Co. is drilling its second test of an unproved fault block near the center of sec. 8,28-29. Coffee No. 2, at 1120 ft. on lands sub-leased from Crestmont Oil Co., is attempting to obtain Vedder zone production comparable to that found in the southeast corner of the section, where Crestmont has just finished its seventh well pumping 250 bbls. of 17 gravity clean oil. Trico's first well, Coffee No. 1, was drilled to 1578 ft. in barren Vedder found at 1560 ft. Jewett formation at 1380 ft. showed some evidence of oil saturation in this try, but were considered too lean for testing.

Near the northeast corner of sec. 12, 28,28, at the north edge of Round Mountain and east of the West branch of the Round Mountain fault, D. G. Vedder hung up California Lands No. 1 after topping barren Vedder at 1754 ft. and bottoming in gray sand at 1801 ft.

Drilling in the southwest quarter of sec. 9,28-29, east of the Crestmont Pool, F. D. Goody, associated with Bernard Le Mohn, et al, finished Olcese No. 9-9 in grayish green sandy Walker clay at 2023 ft. Abandoned August 22, the well proved the absence of Vedder sands in this locale.

Spartan Oil Co.'s Hiatt No. 1, drilling near the north quarter corner of sec. 32, 28-29 at the extreme south end of Round Mountain, was last reported at 2085 ft. Information concerning formation placed gray sand at 2065 ft. with one core yet unopened. Oil showings were noted in the Jewett below 1400 ft.

Rio Bravo Field Takes New Trend

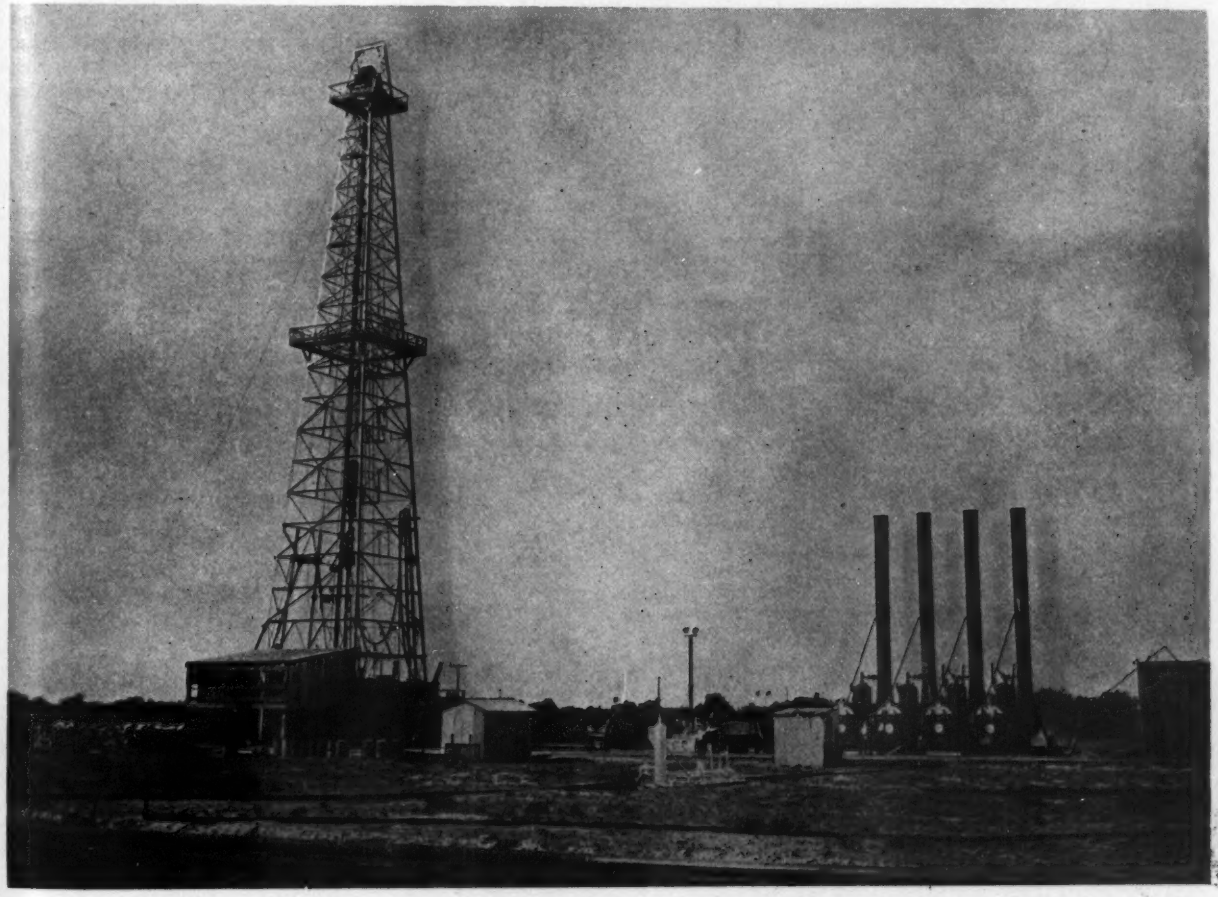
Complications concerning the most northerly of Rio Bravo wells now tend to confirm the northerly inclined dog-leg shown on some geophysical pictures of this field.

With Superior Oil Co.'s extreme northwesterly outpost abandoned at 12,324 ft. after finding the Rio Bravo sand barren at approximately 12,220 ft., a fault of major displacement is indicated between this well, in the southwest quarter of section 21, and Superior's Osborn No. 1-1, near the east quarter corner of section 28, which topped the Rio Bravo pay sand at 11,090 ft. The wide discrepancy is further proved by side wall samples taken in Riggs No. 1 which placed Olcese sand inordinately low in the hole.

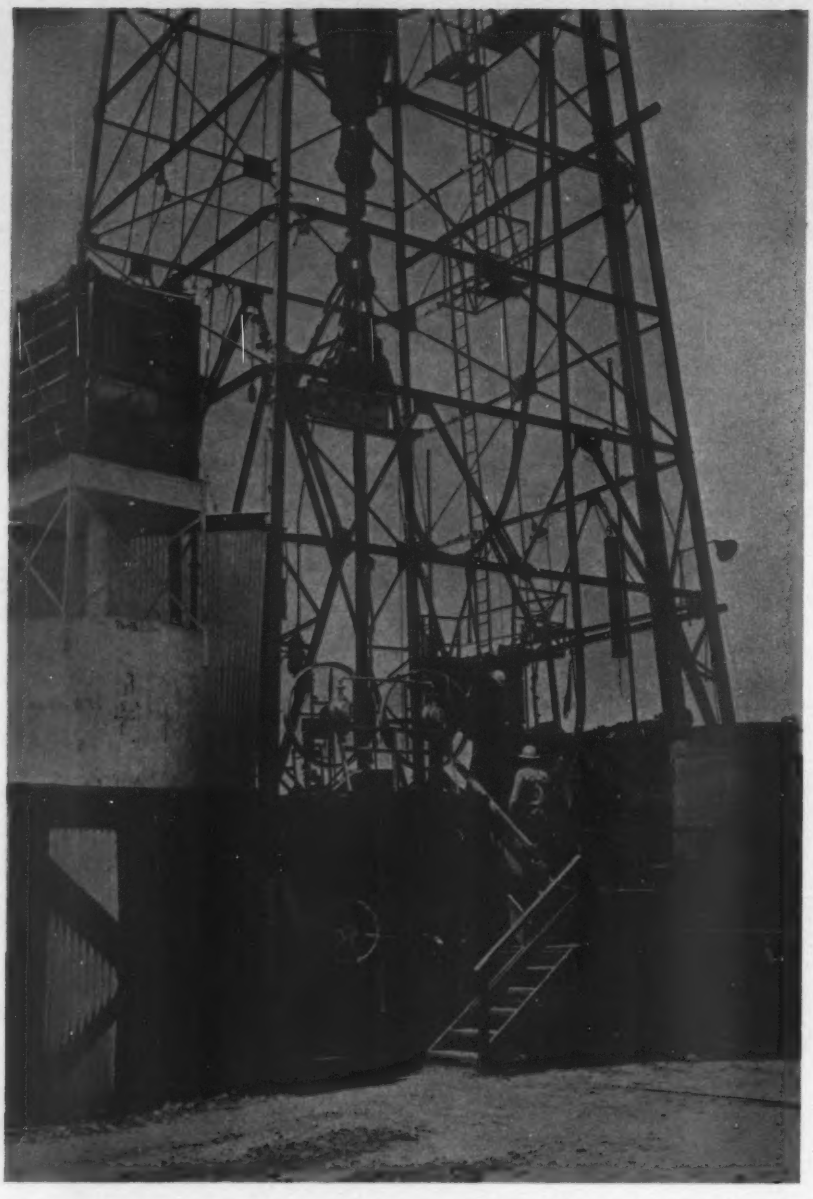
Further proof of the turning of the field's axis is attested by the fact that Osborn No. 1-1, one of the two most northerly producing wells, is found to be the highest well on the structure, while it's companion, Mandel No. 1, is only a few feet lower.

The turning northward of field contours, as evidenced by northwesterly development, takes the play from the trend of leases held by major field operators, and shortens the distance to small blocks of leases held by many companys, beginning at the north line of the section now under development.

The large area already proved at the



Bell & Loffland just completed this well, Richfield's No. 36-28 in Coles Levee, for 1400 bbls. daily of 30 gravity oil.



A treat for the safety inspector is the layout Taft Drilling has at Richfield's No. 52-33 in Coles Levee.

southwest flank of the field is held exclusively by Union Oil Co. and Superior, and will probably be developed in regular order. At the northeast flank of the field, probable productive limits are not so clearly defined, with steep dips already known and which may indicate a fault paralleling the field. As a consequence the extent of production in the small leases north of the present limits will be controlled in a great measure by the trend of development along the northeast flank of the field.

A glance at map No. 4 of the California Oil World's 1940 Reference Edition, now available by order, will clearly show the conditions controlling such northerly development.

Mt. View Well In Gray Sand

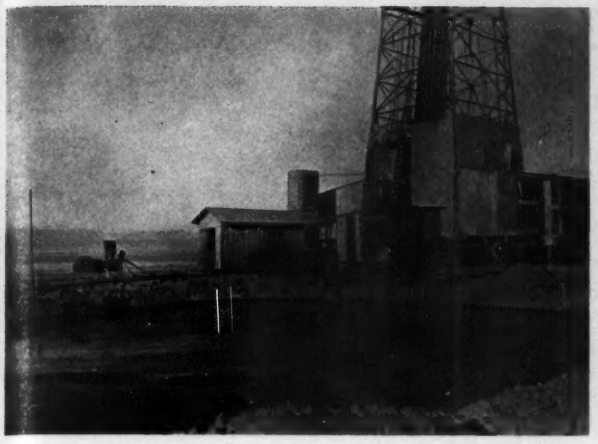
Columbia Oil Co.'s Crawford No. 1, drilling in the southwest quarter of sec. 19,30-29 at Mountain View, was last reported at 5910 ft. in gray sand. Already below the Wharton sand, little is known of the well's position in the geologic column.

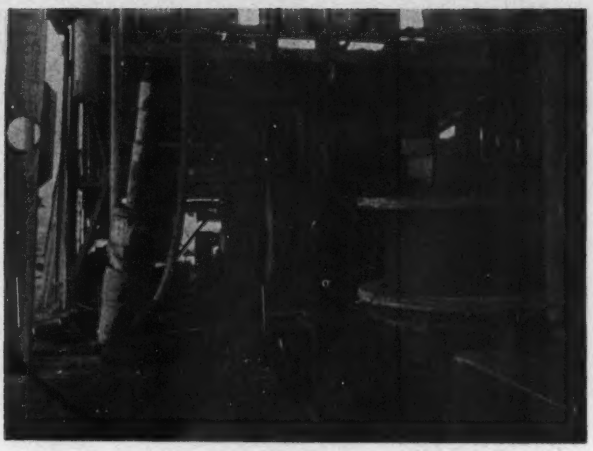
Only well to explore the Temblor here, was Shell Oil Co.'s Porter-Day No. 1, which drilled to 8419 ft. bottoming in Schist, in sec. 29,30-29. Only the Hood zone in the lower Chanac and the Wharton zone in the upper Santa Margarita were found productive in Shell's deep hole.

What is heralded as the world's first liquid gas plant is being constructed at a cost of $1,000,000 near a large eastern city to insure the residents of a reserve supply of natural gas for heating and cooking in winter, and as a protection against wartime emergencies.

Rapidly expanding knowledge of the characteristics of oil pools, or sands, is making it possible to keep old fields on production, to revive those believed near exhaustion and even to re-open wells shut-in for years because they had stopped producing.

Heavy duty roads have been built across the former marshlands of Coles Levee Oil Field.





About all the mystery left at Jergins Mendota Area wildcat is: Will there be a Cheney Ranch No. 2?

Devils Den Test Cores Gray Sand

Seaboard Oil Co.'s Beer No. 66, latest try in the many acres comprising the Beer holdings at Devils Den, is below 5825 ft. in gray sand thought to be Eocene.

Operating on sec. 17,26-17 under an agreement with the Amerada Pet Corp. who holds the Beer property under lease the Seaboard is the newest operator to attempt discovery on this huge structure. Many wells have been drilled in the past, one of which produced a little oil, but all found sand bodies capable of saturation. The presence of these sands, known to contain some oil, coupled with the favorable surface geology, leads many recognized experts to believe that some day production will be obtained in the area.

H. C. Trigg's long idle well No. 1, in sec. 11,25-18, is reported to be readying for an open hole test to bottom at 693 ft. Meanwhile Mr. Trigg has spudded well No. 2 near the west quarter corner of the section, and is drilling below 225 ft.

Gen. Pet. Finishes Greeley Extension

Completed as the most westerly well in the Greeley Extension area, General Petroleum Corp.'s Wallace No. 1, made a 500-bbl. rate through a 12/64 in. orifice. Located near the south quarter corner of sec. 1,29-25, the well is characteristic of the good production obtained under curtailed conditions. Brought in under wraps, the current well flowed with a favorable gas-oil ratio since only 400,000 cu. ft. of gas came with the oil. Production is clean 39 gravity oil flowing under 1600 lbs. pressure.

General Petroleum has spudded Oughton No. 2 in the area, and has graded for Oughton No. 3 and Sullivan No. 3.

Standard Oil Co., only other operator active at Greeley, has spudded KCL No. 12-11, is drilling No. 11-24 below 8300 ft. and is rigging up No. 12-12.

With Mabee Oil & Gas Drilling Co. putting down Richfield's No. 16-28 in Coles Levee are, left to right, W. G. Woodruff, Ernest Lay, R. A. Smith, J. M. Smith, and F. R. Stone.

Union Completes Kettleman Well

Union Oil Co.'s deep Eocene well, Amerada-King No. 9 in sec. 29,21-17 at Kettleman North Dome, was finished from 10,914 ft. flowing 10,000,000 cu. ft. of gas and 300 bbls. of 51 gravity fluid, consisting largely of condensate. The flow, brought in through a 25/64 in. bean, was under 526 lbs. tubing pressure and 2950 lbs. casing pressure.

Added knowledge is making it possible to take a much greater percentage of the oil from the ground; by better spacing of wells, the fullest utilization of underground pressures, and by chemical treatment of the sands.

New source for explosives is natural gas. Processed at low cost by a method recently discovered, the product compares favorably with nitroglycerin and double-base military powders, it is reported.

Aviation Gasoline Stock Pile Approved

Plans of Dr. R. E. Wilson, Defense Commission Oil Advisor, for the storage of 100-octane aviation gasoline have received general approval of the army and navy. The proposal calls for storage by refiners on a rental basis of the bulk of the gasoline procured by the government, and the balance, representing emergency supplies, to be held in government tanks at strategic points. While the program is described as being "fairly substantial", the amount of gasoline to be bought has not, as yet, been determined. Plans for financing the purchase of the gasoline are now being worked out, as are the details concerning government storage facilities. Refiners would be expected to store all gasoline bought for the next six months, and it would probably be a year before government tanks are completed.

A recent survey has revealed that St. Louis, Mo., has asphaltic street pavement which has been in use for 49 years.

Los Angeles Basin

Wood-Mellon Redrills Dominguez Wildcat Well

Finding the Seventh and Eighth Callender zones barren to 7498 ft., Wood-Mellon Oil Co. plugged its important West Dominguez wildcat to 2400 ft. and redrilled to 3270 ft. coring the sand zone below 3150 ft. which had looked interesting on the electric logs and from which wall samples were taken which showed oil. In the second hole, the horizon was barren indicating the showings were caused by infiltration of oil circulated to loosen drill pipe which "froze" while drilling at 6425 ft.

It is the intention of the company now to redrill, whipstocking the hole in a southwesterly direction, and again core the sands corresponding to the Fifth and Sixth Callender zones which showed oil in the original hole. It is believed that the directed hole will encounter these horizons in a more advantageous structural position and that the possibility of finding sufficient sand to support production warrants the comparatively small cost.

Wood-Mellon's well became the center of Los Angeles Basin interest when it became known that it was logging Dominguez field markers at depths almost identical with producing wells in the Avalon Blvd. section and when wall samples at 3150 ft. showed oil saturation it was thought by many that a major discovery had been made. Deepened, the well found stringers of sand with good cuts in the Fifth Callender at 6500 ft. and several feet of good oil sand in the Sixth Callender at 6800 ft. Prospects for deeper production were excellent at this point but the Seventh zone, topped at 7015 ft., and the Eighth at 7380 ft. were barren and the well was plugged back from its final bottom of 7498 ft.

Three Wells Drill E. Coyote Hot Spot

Three wells are now drilling in the East Coyote "Hot Spot" recently developed by Master Petroleum Co. Deepest of the trio is Hathaway Co.'s Johnson No. 4 which is below 3500 ft. near the northwest corner of Valencia and Golden Avenues. Southeast of the same intersection, Barth Oil Producers spudded its No. 1 well on the Queyrel property while north of Golden and east of Carolina Ave., Metro Petroleum Co. is resuming drilling after a temporary shut-down. Offsetting Master's properties to the west, Angle Oil Corp. is preparing to drill Bagnal No. 1.

In the Yorba Linda area of the field, Silver Star Oil Co. is drilling Scott No. 1 below 1500 ft. and Geo. Morgan is near the some depth in Fricke No. 2.

Bartholomae Oil Corp. is preparing to redrill one of its old wells in the extreme westerly section. Standard Oil Co.'s Coyote No. 2-14 in the same area is drilling below 3930 ft.

Continental Abandons Second Howell Test

Finding nothing in the way of productive sands in Howell No. 2, Continental Oil Co. abandoned the project at 5422 ft. The well was located on the axis of the so-called Reservoir Anticline in sec. 34,3-16, three quarters of a mile northwest of No. 1 which was drilled earlier this year and abandoned at 4260 ft.

New Wells Planned For NW Wilmington

If present plans materialize, two wells will soon be drilled in the Vesta area between the Wilmington and Torrance fields. At the southeast corner of "M" and Frigate Sts., Albert Stevenson's Acoma Oil Co. is said to be awaiting only the final OK of the Los Angeles City Planning Commission, while at the intersection of Mauretania and Frigate, H. G. Stevenson expects to start work by the middle of September. Al Hunter, who pioneered this district, will handle the engineering work.

The Vesta Petroleum Co. well, located at the southwest corner of State St. and Figueroa, a block west of the projected new wells, is a small pumper in the upper Wilmington sands.

Del Valle Test Shows Promise

Showing much promise of becoming the first important California discovery since Paloma was brought in during August of 1939, R. E. Havenstrite's Lincoln No. 1 is planning a formation test of a good looking oil sand body cored to present bottom 6804 ft.

Located on Del Valle Anticline in after water intrusion necessitated rece-

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	Melrose Pet. Co.	1	12, 3-14		Rig
Castaic	Colter, R. T., Explor.	1	8, 4-17	1338	Idle
	Havenstrite, R. E., Lincoln	1	16, 4-17	6794	Drilling
	Worland Oil Co., Jenkins-Owens	1	18, 5-16	2790	Idle
	Nevada Drlg. Co., Dominguez Est.	1	31, 3-13	1000	Drilling
Dominguez, West	Wood-Mellon Oil Co., Wood	1	31, 3-13	7498	Redrilling
Inglewood	Vanguard Oil Co., L.A.I.	1	29, 2-14	1041	Idle
La Habra	Security Land & Water Co.	1	9, 3-10	4557	Drilling
	Union Oil Co., Sansinena	12	31, 3-10	5698	Idle
Mint Canyon	Redwood Oil Co., Mitchell	2	22, 4-15	985	Idle
Newhall	British-American Oil Prod Co., Edwina	1	14, 3-16	6196	Idle
	Astec Oil Co., Sanborn	1	6, 3-16		Location
	Canyon Oil Co., Sanborn	1	6, 3-16		Rig
	Consolidated Pet. Co., Needham	4	13, 3-16	4398	Idle
	Creighton Hammon Synd., C.H.	1	17, 3-16	990	Rig pump
	Irene Oil Co., Kraft	1	31, 4-15		Rigging up
Palos Verdes	Rolling Hills Pet.	1	27, 4-14	6580	Idle
San Fernando	Casa Grande Oil Co., Lopez-Lundy	1	1, 2-15	3785	Idle
	Contiental Oil Co., Howell	2	35, 3-16	5422	Prep to abandon
	Parry, Geo. G., Moynier-Parry	1	6, 2-14	4216	Idle
West Whittier	Cal. Pico Oil Co., Beach	1	7, 2-11	5603	Drilling
	Orange County				
Costa Mesa	Thompson, Milton N., Banning	1	9, 6-10	5625	Idle
Garden Grove	Bird & Chambers	1	31, 4-10	1250	Idle

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Madera	Blake, Thos. M., Arnold	1	22, 10s-17e	3204	Idle
Merced	Don Pedro Oil Co.	1	9, 6s-9e	1435	Drilling
Monterey	Loma Grande Oil Co., Corey	1	23, 24s-10e	1587	Idle
	Preist Valley Pet. Co., Greve	1	22, 20s-12e	2885	Reaming
Sacramento	Bishop Oil Co., Wilmar	1	21, 4n-3e	4140	Idle
	Standard Oil Co., Rio Vista State	1	31. 4n-3e	4520	Cleaning out
San Mateo	Ra-Lite Petroleum, Inc., Bell	5	16, 7s-4w	600	Drilling

sec. 16,4-17 west of Castaic, the project has enough sand in below 6030 ft. in the Modelo topped at 5750 ft. to make a well in the opinion of qualified observers. Though somewhat similar to conditions found by Barnsdall Oil Co. in the nearby Newhall-Potrero field, the stratigraphy differs in that there was no definite break between the first and second zones and the last encountered horizon, topped at 6676 ft., appears to be lower in the section than Barnsdall's Third zone which is missing at Del Valle.

The geology of the Del Valle area was worked out by R. W. Sherman for R. E. Behring of Lincoln Petroleum Co. who acquired the leases and turned them to the Havenstrite organization for development.

Inglewood Deep Zone Proved by Bush Test

The existence of a deep Miocene zone in the Inglewood field was demonstrated by recent tests in R. R. Bush Oil Co.'s Sentous No. 1 on the westerly flank of the old shallow production. With bottom at 8439 ft., a formation tester was set at 8320 ft. and the valve opened for an hour and fifteen minutes during which time the 1000-ft. water cushion reached the surface in 18 minutes and flowed with a strong gas blow. While pulling the drill pipe, with 40 stands yet in the hole, the remaining oil, gas and water cushion blew out, completely emptying the pipe.

Following the favorable formation test, 7-in. casing was cemented at 8325 ft. and a test for water shut-off made with the hole cleaned out five feet below the shoe. This time the tester, open one hour, recovered five stands of oil estimated 33 gravity and two stands of drilling mud. Gas reached the surface in eight minutes and blew at a rate estimated at 2,000,000 cu. ft. per day.

The well is being deepened to explore the extent of the new horizon and at 8536 ft. was still in good oil sand.

At the north end of the field, Federal Oil Co. is prepared to deepen its Smith No. 1 from its present 6700 ft. bottom when the Bush well is completed.

Union To Drill Deep In Long Beach Field

Union Oil Co. has derrick up for Long Beach Community No. 19 at the corner of 25th St. and Rose Ave. for a southerly offset to R. W. (Rocky) Jerman's 10,411 ft. Dormax Oil Co. No. 1. Completed last December on gaslift for 450 bbls. a day, the Dormax well is now flowing naturally about 250 lbs. In the 5000 ft. zone, Dormax No. 2 is a 100 bbl. pumper.

Continuing development of the cemetery property, M. & T. Oil Co. is preparing to set casing in Oil Exchange No. 4, the surface location for which is south of Willow and east of California. North of the Jergins Municipal lease, Safeway Oil Co. is preparing to make a production test in well No. 4, bottomed at 4900 ft.

The new good producers at Huntington Beach do not monopolize the interest in the area. The Hall-Scott pumping unit on skids (A. C. F.) has proven itself on this slant drilled well.

Mission Finds New S. Rosecrans Zone

Finding the deep or Eighth Callender zone not commercial, Mission Oil Co. plugged its Pierce No. 1, perforated the Zinns zone equivalent from 6140 to 6280 ft. and completed flowing an estimated 1,500,000 cu. ft. of gas with a considerable amount of high gravity condensate. This zone has not here-to-fore been tested in this section of the field and the completion is virtually a new discovery which shows promise of being a life saver for the several marginal wells in the vicinity of Compton Blvd. and Avalon.. A charcoal test of the gas is said to have indicated a possible recovery of eight gallons of casinghead gasoline per 1000 cu. ft.

In the Main St. area where large producers are the rule, St. Anthony Oil Co. is completing Gordon No. 4 at 7825 ft.

Running a pump on tubing at Union Oil Co.'s Alex No. 3 Santa Fe Springs. Photo courtesy, Alexson Mfg. Co.

●

menting the shoe of the 6⅝ in. water string at 7542 ft. Southern California Petroleum Co. is finishing two wells, Maxwell No. 13 and Van Nuys No. 1, the latter delayed two weeks by casing trouble. Both will extend production north of the limits established during the drilling boom of a year and a half ago. Royalty Service Corp. is below 4200 ft. in its No. A-W-1 at the southeast corner of Redondo Blvd. and Main.

Dominguez Outpost Tests Upper Zones

Gibraltar Drilling Co., dissatisfied with the 25 bbl. production from the Eighth Callender zone at 8100 ft. is perforating and testing the Sixth and Seventh Callender horizons. Holes shot in the casing at 7080 ft. resulted in a flow of water and are being cemented.

Union Oil Co. is completing two westerly wells, Austin No. 4 at 7530 ft. and Callender No. 78 at 7375 ft.

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Signal Drills Two Huntington Wells

The flat land west of Huntington Beach proper, where Standard Oil Co. recently completed good wells, is the scene of operations for two Signal Oil & Gas Co. projects, Signal-Bolsa No.'s 14-A and 15-A. Located a quarter of a mile north and slightly west of Standard's Bolsa No.'s 39 and 42, in the west half of sec. 34,5s-11w, the Signal wells are each drilling near the 3400 ft. level.

Drilling of the new wells was in part prompted by the phenomenal success Standard had in its two wells. Bolsa No. 42, second to finish, flowed in excess of 500 bbls. per day from four zones. Upper Ashton sands were open from 2784 to 2934 ft., lower Ashton from 3094 to 3897 ft., while the most prolific sands seemed to be opposite perforations from 3977 to 4354 ft. and 4659 to 4780 ft. Bottomed at 4783 ft. in shale, No. 42 was thoroughly tested by stages through the drill stem prior to running pipe.

Drilled from a site on the bluff north of Ocean Ave., and with hole whipstocked seaward below state tidelands, Southwest Exploration Co. finished State No. 30 from 4500 ft. Highest rate following completion was 1606 bbls. of clean 24 gravity oil. Southwest is drilling No. 31 below 900 ft. to a like zone.

Also drilling from land site to seaward bottom, The Termo Co.'s Fee No. 6 was last reported at 3700 ft.

The Five Points area, northeast of the main body of the field, is experiencing one of its periodic slumps. While four rigs have been built to drill for the small production found here, none have actually started drilling. Production in the small pool averages near or just below 75 bbls. per day. While the volume is low, the gravity ranges around 16 and the low cost of drilling attracts the smaller operators.

Wilmington Field Completions Told

Seven wells were completed in the Wilmington field during the past fortnight all but one of which were located within the Long Beach area. Largest of the lot was Long Beach Oil Development Co.'s "W" No. 16 on Terminal Island, a three zone producer which initialed over 1200 bbls. on restricted flow. Union Pacific's Edison No. 27, completed in the Upper Terminal zone, was another good one, doing over 600 bbls. through a small bean.

In the easterly Long Beach area, good Ranger zone wells were completed by Continental Corp. on the Flood Control Channel; Hammarson Oil Co. at 9th St. and Pico; and Los Angeles Basin Drilling Co. in the Anaheim area. Hancock Oil Co. finished a good well in the central Harbor district.

Only Wilmington completion was V. R. G. Wilbur's Krieger No. 4 which was redrilled to 3710 ft. and brought in on the pump for 190 bbls.

Rigging up a cement gun during the cementing of a string of casing with a Dual Seal Cementer. Photo courtesy of Lane-Wells.

New Potrero Well Flows 310 Bbls.

Basin Oil Co. which put the Potrero field on the map two years ago, obtained another good producer in Potrero No. 8, completed recently after gun-perforating casing cemented on bottom at 3693 ft. Though the initial rate was over 400 bbls., the well is now beaned back to 310 bbls. of 39 gravity oil.

Tide Water Associated Oil Co., discoverer of the field in 1927, is deepening Cypress No. 3 at 4880 ft. and Beloil Corp. is preparing to redrill its well No. 1.

Inca Testing Athens Well

Inca Oil Corp. is making a production test in its No. 1 well at Athens, the former Union Oil Co. Howard Park No. 15. Casing was set on bottom at 8355 ft. and gun perforated in the O'Dea zone interval 8230-8330 ft. The fluid contained much oil after the first few hours of swabbing.

Thorley Oil Co.'s discovery well of the area is flowing 210 bbls. a day of 32 gravity clean oil.

Only driller at present is Southern California Petroleum Co.'s Athens No. 12-1A across the alley to the south of Thorley. With Tom Pike doing the drilling, depth is below 3200 ft.

Coastal District

Tex-Harvey to Drill Gilmore Huasna Play

Tex-Harvey Oil Corp. is rigging up to drill Gilmore Community No. 1 in the Huasna area of San Luis Obispo county. Located on a large block of leases taken originally by Gilmore Oil Co., the well will be drilled in sec. 11, 32-14, two miles northwest of Superior Oil Co.'s Tar Springs Ranch No. 1 which is currently drilling below 5000 ft.

Tex-Harvey Oil Corp. is headed by Arthur Harvey and Alford McCloskey. Mr. McCloskey is well known to the industry through his association with Macson Oil Co., a substantial Los Angeles Basin producing company. Geology of the play was worked up by two of the best known geologists in California, Robert B. Moran and Clarence B. Osborne.

Santa Maria Well Pumps 200 Bbl. Rate

Pumping at the initial rate of 200 bbls. a day with a 30% water content, Union Oil Co. completed Mallory No. 3 in the Santa Maria Valley field. Hole was bottomed at 5440 ft. with slightly more than 400 ft. of formation open. The project is located near the west quarter corner of sec. 27,10-34 near the old Lakeview school.

In sec. 20,10-34 near the probable northerly limits of Monterey shale production, Fred E. Cole is drilling below 800 ft. on Tognazzini property.

Union Oil Co. is drilling Le Roy No. 5 in the west portion of the field and is preparing to build derrick for Bradley Lands No. 2-1 in the extreme southeast section.

Ventura Development Continues to be Active

Activity throughout Ventura county continues at its highest rate in recent years as independent operators seek to develop new production. Shortage of places where a small operator may drill with a reasonable expectation of obtaining a pay-out has forced the more aggressive independents out of their usual Los Angeles Basin and San Joaquin Valley field activities and taken them to Ventura where there is known to be much undeveloped oil land.

Most interesting of the recently announced wildcats is Hopland Oil Co.'s proposed test of a well-defined anticline in sec. 1,3-19 near Shiells Canyon. A. E. Schultz is in charge of operations for the company.

Near Bardsdale, Reed Elkins and Westoil Corp. are seeking shallow production in sections 5 and 6 respectively of township 3-19. Using light portable equipment, both wells are down about 500 ft.

Sulphur Springs Oil Co. is planning to resume drilling in its 4256 ft. wildcat on the large Janss Investment Co. holdings in sec. 33,2-19 near Conejo. The well is on a previously undrilled structure.

Three wells are working in the Santa Paula-Ojai area, one of the first oil producing districts in California. Seaport Oil Corp. is rigging up to deepen the old Martin-Arnett No. 3, sec. 15,4-21, below its present 1900-ft. level, while Norwood Oil Co. is preparing to deepen Coronet No. 2 and Per-Col Oil Co. is fishing for drill pipe in Anlauf No. 6 at 1805 ft. The latter wells are located respectively in sections 17 and 21.

Jack English apparently has another good producer in his Lankershim No. 3, in Hopper Canyon which he has just put on the pump at an initial rate estimated close to 200 bbls. a day. At first over 50%, the cut seems to be cleaning up satisfactorily. Located in sec. 13,4-19, the well employs nearly 900 ft. of formation open to bottom at 3285 ft.

Merchants Petroleum Co., Cochran No. 8, sec. 1,4-20 in the Sespe country, is deepening below 2700 ft. in Sespe shale and sand which shows fair cuts. The company drills with cable tools and carries a string of 6⅝-in. casing including 100 ft. perforated on bottom.

In the Shiells Canyon field, Temulac Oil Co. has plugged the 3200 ft. Calumet No. 6 to 2400 ft. preparatory to redrilling and deepening. In the same field, Consolidated Petroleum Co. suspended Calumet No. 8 after deepening to 4075 ft.

Seeking new production adjacent to the old South Mountain field in sec. 17, 3-20, California Securities Oil Co. is drilling below 2400 ft. Many streaks of fair-to-good oil sand have been encountered below 2200 ft.

Elwood Wildcat Fails in Sespe

A failure in the Sespe, The Texas Co.'s Bishop No. A-1 was written off as a dry hole at 4350 ft. Located north of the State Highway near the Elwood field, the well found no encouragement in the Vaqueros in which a formation test recovered salt water. Vaqueros was entered at 3300 ft. and the Sespe was topped at 3760 ft.

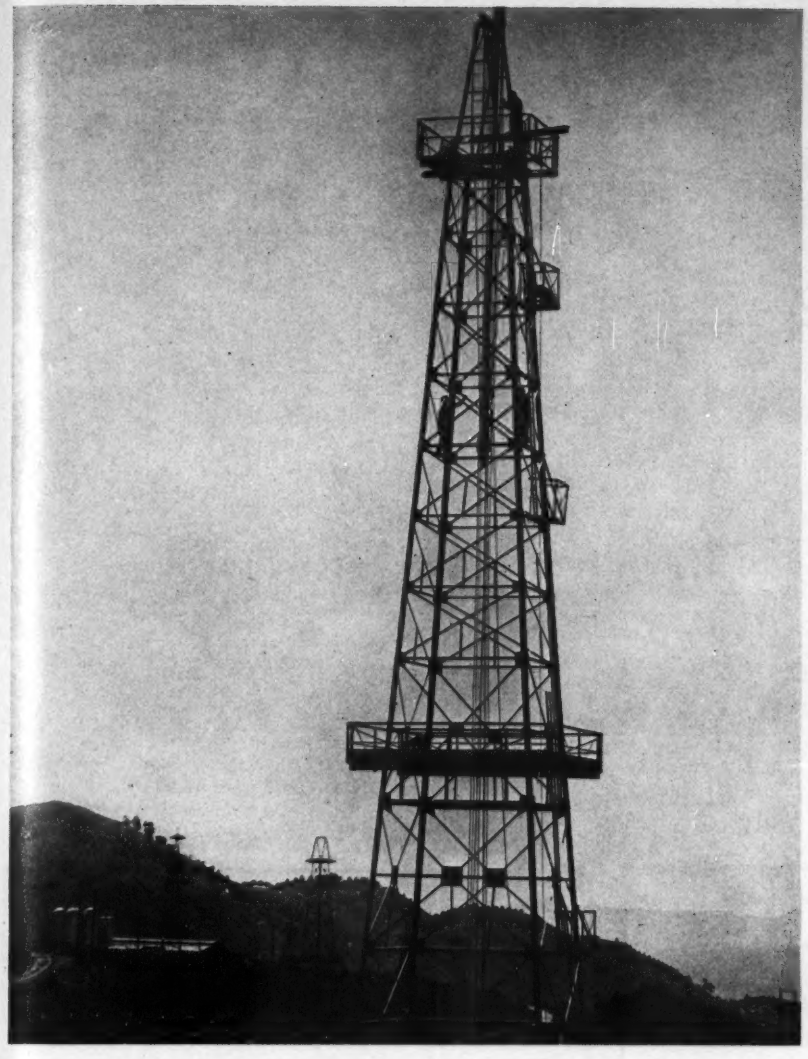
Ten Wells Drilling At Ventura Avenue

With activity at Ventura Avenue confined to only four operators, there are but ten strings of tools running now in the field. Since completion of present drilling programs by California Alliance Oil Co. and British American Oil Pro-

COASTAL COUNTIES WILDCATS

Santa Barbara County

Area	Well	No.	Section	Depth	Status
Betteravia	Union Oil Co., Peszoni	2	33, 10-35	6370	Drilling
Elwood	The Texas Co., Bishop	A-1	13, 4-29	4350	Abandoned
Santa Rita Hills	Tidewater Assoc. Oil., Souza	1	12, 6-33	2698	Drilling
Summerland	Barnato Group, The, Hyland	1	16, 4-26	3277	Idle
	San Luis Obispo County				
Elkhorn	Calif. Pet. Prod., Irons	1	19, 10-24	2527	Pumping water
Huasna	Tex Harvey Oil Corp., Gilmore Comm.	1	11, 32-14		Rig
	Superior Oil Co., Tar Springs	1	24, 32-14	4972	Drilling
	Ventura County				
Bardsdale	Elkins, Reed	1	5, 3-19	592	Idle
	Hopland Oil Co.	1	1, 3-19		Grading roads
	Westoil Corp.	1	6, 3-19	330	Drilling
Conejo	Sulphur Springs Oil Co., Janss	1	33, 2-19	4526	Idle
Ojai	Seaport Oil Corp., Arnett	3	15, 4-21	1900	Prep. to deepen
	Norwood Oil Co., Coronet	2	17, 4-21		Rigging up
	Norwood Oil Co., Coronet	3	17, 4-21		Grade
	Per-Col Oil Co., Anlauf	6	21, 4-21	1800	Fishing
Santa Susana	K. C. Oil Co., Marr	1	32, 3-17	1716	Idle
Sespe	English, L. A., Lankershim	3	13, 4-9	3285	Completed
	G. E. Development Co.	7	13, 4-19	895	Idle
	Merchants Pet. Co., Cochrane	8	1, 4-20	2668	Drilling
	Riley, Irene Burson	1	18, 4-19	1752	Drilling
	Rio Hondo Oil Co., Cosby	1	14, 4-19	1695	Idle
South Mountain	Calif. Securities Oil Co., Schieferle	1	17, 3-20	2600	Drilling.



The cameraman can choose many angles in shooting wells in the hilly Ventura play.

ducing Co., Lloyd Corp. is the only independent now active. The Lloyd interests are drilling two wells, the balance being divided among General Petroleum Corp., Tide Water Associated Oil Co., and Shell Oil Co.

Most recent completion was Shell's Taylor No. 121 which, open at intervals from 5750 ft. to 7365 ft., was brought in flowing 350 bbls. a day.

Santa Rita Well Cores Hard Silt

In the Santa Rita Hills, east of the city of Lompoc, Tide Water Associated Oil Co. is coring hard siltstone in Souza No. 1. Believed to be still in the Temblor at 2800 ft., very few showings have been reported save evidences of gas at 2350 ft. The test is located on a large structure in sec. 12,6-33.

Union Pezzoni Below 6250 Ft.

Union Oil Co.'s Betteravia wildcat, Pezzoni No. 2, is reported to be drilling ahead below 6250 ft. without having yet encountered signs of production. Located only a short distance north of No. 1 which entered the Franciscan basement at a relatively shallow depth, the second try is said to be still in Sisquoc formation.

Tide Water Abandons Deep Trico Oil Try

Near the center of sec. 22,24-23, at the north flank of the Trico gas field, Tide Water Associated Oil Co. has plugged Daniel No. 35 to 3134 ft. Bottomed in gray Eocene sand at 11,728 ft., the well parellels the unfruitful results of previous deep drilling in the area. The three important geologic markers of the area were placed in normal position in the following order: Olcese at 9425 ft., Vedder at 10,315 ft., and Eocene at 11,705 ft.

With a 490 ft. liner cemented on plugged bottom at 10,900 ft. and a formation tester packer in the top for a test of lower Vedder showings, the well showed only a light blow of air. Fluid recovery was 7300 ft. of thin mud and salt water when the pipe was pulled. Operators may perforate the 13⅜-in. casing for tests of the normal shallow gas sands.

Texas Co. Spuds 2nd Cantua Try

Successor to S.P. No. 1, which proved the presence of wet gas in the area which The Texas Co. holds under lease in the Cantua Creek district, Everding No. 1 is drilling below 1200 ft.

This second attempt is in sec. 24,17-15, a few hundred feet southeast of its predecessor.

Jacalitos Hills Try Drilling at 8700 Ft.

Last reported at 8727 ft., with formation at bottom a matter of conjecture only, Continenal Oil Co.'s Kreyenhagen No. 1 is already in the deep hole class.

Located in sec. 4,22-16, due west of Kettleman Hills and south of Coalinga Eocene Pool, the well is believed to be in search of an Eocene closure comparable to one of the other fields.

Rumor has placed the well already deep in the Eocene which, if true, writes off the original intent and leaves only the Cretaceous as a chance at production.

One Wildcat Active In Belridge Area

De Lanty & Sutton's Trustees No. 1 is the only wildcat working near the Belridge fields. Located in sec. 28,28-22, east of the South Belridge field, the try was last reported in sandy shale at 2835 ft.

Santa Mora Oil Co. is, however, planning to start well No. 1 on sec. 10,28-20, off the southerly tip of the North Belridge field.

Northern "Cat" Stands Idle

Idle, after swabbing mud in the latest effort to force fine, tightly packed Eocene sands to yield some fluid, Jergins Oil Co.'s Cheney Ranch No. 1 gives every appearance of being a "dud." Drilled in sec. 29,14-13 to a total depth of 9345 ft.

and redrilled to 7200 ft. for tests of sands thought mudded off in the first operations, the well at no time has showed any great quantity of gas or fluid. Shut-in to build up pressures, the well blew dry in a matter of minutes, indicating that the sands are very tight.

It is possible that sands elsewhere in the area could be found permeable enough to provide a suitable reservoir for accumulation, hence a possibility of Eocene production. At press time there is no indication as to plans for further development in the area where the company holds several hundred acres under lease.

L. A. County to Speed Drilling Operations

Authority to speed up drilling operations on county land on the west bank of the Los Angeles River in the Long Beach-Wilmington field was voted August 13 by the Board of Supervisors to H. E. Hedger, county flood control engineer, in charge of the area. The Board said it was necessary to speed up activity to safeguard the county against depletion of the field by private companies before wells on county property begin producing.

Bell & Loffland's J. M. Grant made a barbecue pit and then had to prove he knew how to use it. Above, part of Bell & Lofflands' office staff in Los Angeles is testing the "Qed" chicken. The drinks were very soft.

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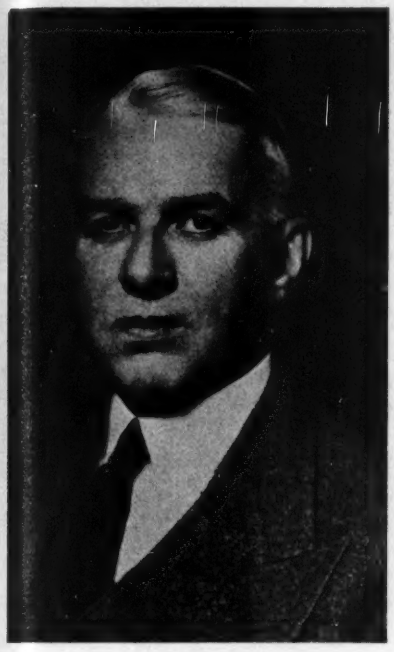
Standard Promotes Three Executives

The board of directors of the Standard Oil Company of California today elected J. M. Tuttle a vice-president to fill the vacancy created when H. D. Collier was



J. M. Tuttle

J. H. MacGaregill

elected president succeeding W. H. Berg, who died recently.

J. H. MacGaregill, general manager of marketing, was elected a director filling the vacancy created by the death of Mr. Berg. On becoming a member of the board, Mr. MacGaregill retains his position as general manager of marketing.

At the same time B. W. Letcher, general auditor and assistant secretary was elected secretary and comptroller, functions hitherto carried on by Mr. Tuttle.

Mr. Tuttle entered the service of the company in the home office in San Francisco in July, 1903, thirty seven years ago. In 1918 he became assistant general auditor and general auditor in 1920. In 1921 he was given the additional title of assistant secretary, and in 1922 became secretary. In 1926 he was appointed secretary and comptroller. He was elected to the board of directors in December 1930.

Mr. MacGaregill entered the service of Standard Oil Company twenty three years ago, as warehouseman at San Francisco, later transferring to service station salesman, he progressed through many positions in the sales department until, upon the organization of Standard Stations, Inc., he was elected a director of that subsidiary and appointed manager of the merchandising department. In January 1932, he was appointed general manager and chairman, management committee, Standard Stations and in 1934 was elected vice president of Standard Stations. In January 1938 he was appointed general manager—marketing, of Standard Oil Company of California.

Mr. Letcher entered the services of the Company in 1911 as a clerk in the manufacturing department. In due course he was promoted to chief clerk in the general office. In 1920 he was made assistant general auditor and in 1926 general auditor and assistant secretary.

New Type Portable Drilling, Servicing, Rigs Brought To California By Hillman-Kelley, Inc.

A new type of truck-mounted "slim hole" drilling rig, and a truck-mounted telescoping 84-foot servicing derrick are being introduced in California by Hillman-Kelley, Inc., 2439 Hunter St., Los Angeles, recently appointed representative for the Franks Manufacturing Corp., of Tulsa, Okla., designers and makers of the new portable drilling and servicing units.

Emphasis will be placed on the telescoping servicing derricks. The first such unit for use in California will be shipped to the Signal Oil & Gas Co. of Long Beach the latter part of August.

Concurrently with the announcement of the appointment of Hillman-Kelley as California representatives, Carl White, Jr., vice president of the Franks corporation, revealed that the capacity of the Franks Manufacturing Corp. plant had been doubled, bringing the number of workmen to 180.

Franks Manufacturing Corp. was organized in 1930 by H. H. Franks and Carl White, president and vice president, respectively. Since that time, the firm has specialized in such revolutionary oil field equipment as portable rotary drilling units on wheels, and portable servicing derricks which telescope to their working position and are truck-mounted.

Other items pioneered by the Franks organization include, it is claimed, the first successful power take-off, a transmission designed to make use of the truck motor for the power necessary to operate portable drilling and servicing units; final friction drive well servicing winches, and open face derricks mounted on trucks. Franks units are in service

James Moon

in all important oil fields of this country, and in Venezuela, Peru, Roumania, Russia, and Greece.

Because the specifications for the Franks units demand both strength and minimum weight, specifications also followed in the aviation industry, the company called in engineers from the airplane industry to design the portable equipment. James Moon, one of the engineers, is consulting with Hillman-Kelley in connection with the introduction of the units in California fields.

Nomads Hear Conditions In Near East Countries

The regular monthly meeting of the Nomads was held at the California Country Club in Los Angeles, Aug. 14. Except for committee meetings held previous to the dinner, the affair was entirely social. Due to the absence of the president, Ted Sutter, the ceremonies were conducted by Sam Bowen, vice-president of the chapter.

All oil men who have seen foreign service are invited to be guests of the NOMADS at their first annual barbecue to be held Wednesday evening, September 11, at the General Petroleum Barbecue Pits at Brea. This announcement was made last week by Ted Sutter, President of the local NOMAD chapter, who went on to say. "We are anxious to bring all oil men who have had foreign experience together at this meeting. By that we mean not only men who are active at the present time in foreign operations but men who have traveled in foreign fields but are now employed in California."

To facilitate the handling of guests and to qualify the attendance, the affair is strictly invitational. Any oil man with foreign experience phoning Henry Pullman or George Barry, at Jefferson 8211, will be mailed immediately an invitation and ticket for the barbecue. Arrangements for dinner are being handled by Tom Murphy, of the Martin-Decker Corporation, who guarantees every NOMAD and guest will receive a steak weighing over one pound. Entertainment is in charge of Ernie Fowks, of Emsco Derrick and Equipment Company, who has worked out a program involving games of skill in which luck may play a rather important part. There will be no speeches, no movies, or anything to detract from what should be one of the biggest and best parties the NOMADS have staged to date. Further information and directions for reaching the party locale will be furnished those planning to attend.

An informal address was given by Charles Hauenstein of the Iraq Petroleum who discussed the present conditions and the operating methods in the near eastern countries. C. H. Curtis, who recently returned from Argentina where he had been doing geological work for the Y.P.F. in Patagonia, spoke on relations with Latin American countries after describing the work done in the unproven areas south and west of Comodoro Rivadavia. Motion pictures showing the country were then given.

Among the men from foreign countries who were present were: John Domeroq, California Arabian Standard; H. G. Baker, Bahrein Petroleum; H. C. Creath and R. W. Perry of Ultramar, Argentina; C. K. Banton, British Burmah; A. V. Sardania, C.N.P., Brazil; James Schaffer, Tex.-Col. Petroleum, Colombia; M. H. Bush, Bahrein Petroleum; and M. J. Bonzerio, Y.P.F., Argentina.

New Gate Closing Engine Speeds Control Operation

Shaffer Tool Works, Brea, Calif., is now furnishing a Gate Closing Engine for opening and closing Shaffer Cellar Control Gates or for operating any type of gate valve, master valve or similar equipment with a speed never before possible. This Engine is designed for steam

operation but can be furnished to operate with water at slightly less acceleration. It will operate one or two gates.

The power mechanism of the Shaffer Gate Closing Engine consists of a turbine which is reversed by operating a three-way valve, and the speed of which is regulated by a governor valve. The turbine rotor shaft is connected through 4-to-1 speed reducing sprockets and chain to a countershaft, and the drive is extended to the gate by lazy rods (torque tubes) which are coupled by Shaffer Universal Joints. This arrangement increases the power at the lazy rod four times that at the rotor shaft.

A 2-inch steam line from the boiler connects to a brass gate valve just ahead of the governor valve and thence to the 3-way valve. The power device consists of a 16" diameter rotor with multiple vanes, enclosed in a steam-tight housing. The perimeter of this housing is made into an annular space which can be compared with the steam chest of a steam engine. This annular space is divided into two circular pressure-tight compartments surrounding the rotor. Through multiple jets, set at the proper angle, the steam impinges upon the vanes of the rotor. One compartment, or steam chest, has the nozzles set to impel the rotor in one direction and the nozzles in the adjacent compartment are set to impel the rotor in the opposite direction. At the 3-way valve the steam line is divided into two 2" lines, one of which leads to the compartment for forward motion, and the other line leads to the adjacent compartment for reverse motion.

An impact lug near the axis of the driven sprocket engages a similar lug on the counter shaft, thus permitting four turns of the rotor shaft and practically one turn of the idler driven sprocket on the counter shaft before the lugs contact each other. The speed of the moving rotor at the end of the fourth revolution, or at the time the lug on the sprocket strikes the lug on the counter shaft, creates sufficient impact to jar loose a set of tightly closed rams or enables the operator to hammer a gate to the closed position when conditions make closing difficult.

Foxboro Appoints Bumstead-Woolford

C. E. Sullivan, vice president and sales manager of The Foxboro Co., Foxboro, Mass., announces the appointment of Bumstead-Woolford as exclusive sales representatives for the Oregon and Washington territory. The arrangement became effective as of Aug. 1. The Foxboro Co. manufactures instruments of measurement and control, for industrial processes, and its customers in the Pacific Northwest include the great lumber and paper mills located there, as well as food packers, power plants, and companies in every other industrial field.

The firm of Bumstead-Woolford was recently formed by Dale Bumstead and O. H. Woolford, both of whom have wide acquaintance and long records of experience in fields of industrial engineering. In addition to the Foxboro line, they will represent a number of other nationally known and noncompetitive industrial equipment manufacturers. The new firm has established its head office at 1411 Fourth Ave., Seattle, and has also taken over the former Foxboro Co. office at Portland, at 301 Lewis Building. E. E. Stephens, an experienced instrument man, and C. H. Graham who, for the past four years has been the Foxboro sales engineer in the Portland district, have joined the Bumstead-Woolford staff.

Bumstead-Woolford will work independently but in close co-operation with The Foxboro Co.'s own organization on the Pacific Coast, under the direction of H. B. Brooks, division sales manager, located in San Francisco.

Canada Prohibits New Filling Stations

As a result of the war, the Oil Controllers office has issued an order prohibiting the erection of any new gasoline filling stations within Canada. The regulation is designed to prevent interference with war business.

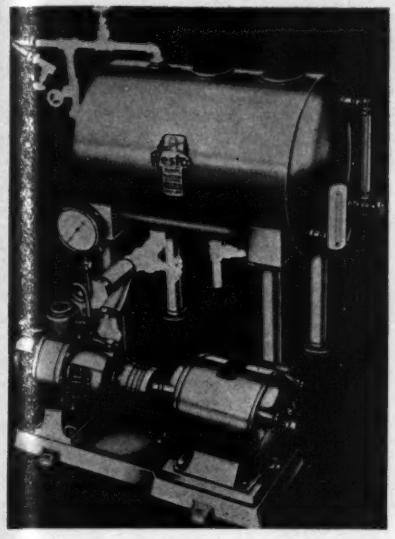
BILL LONG, Havenstrite Bros. superintendent, is in the Loma Linda Hospital recovering from a sudden illness.

R. P. HUGGINS, general manager of Western Gulf Oil Co., suffered painful injuries in an auto collision on the Ridge Route July 31. Mr. Huggins' many friends will be glad to hear of his being back at the office after a period of hospitalization.

Westco Introduces Boiler Feed Systems

Planned especially for boilers up to 750 H.P. and 200 lbs. pressure, Westco Automatic Boiler Return Systems incorporate a number of exclusive features designed to help operators reduce fuel consumption, cut labor costs and increase plant efficiency, the makers say.

These compact, easy-to-install Systems, it is claimed, (1) automatically return all



condensate to boiler, from both high and low pressure equipment; (2) add make-up water as needed to compensate for loss of live steam; (3) maintain a uniform water level in boiler; (4) keep return lines constantly open; (5) eliminate back pressure on return lines; and (6) feature low cost operation and maximum reliability.

Each combination is equipped with a Westco Turbine-Type Pump having patented, renewable liners. This advanced construction is backed by over twenty years' experience in the manufacture of dependable condensate return equipment, permits alterations in performance without changing the entire unit. Renewable liners also guard against costly break-down losses, for it is only necessary to carry an extra set (liners and impeller) at about ⅓ the cost of a replacement pump. Oversize shaft and bearings, with patented bearing adjustment for centering impeller, prevent galling and seizing, offer further protection against excessive maintenance expense.

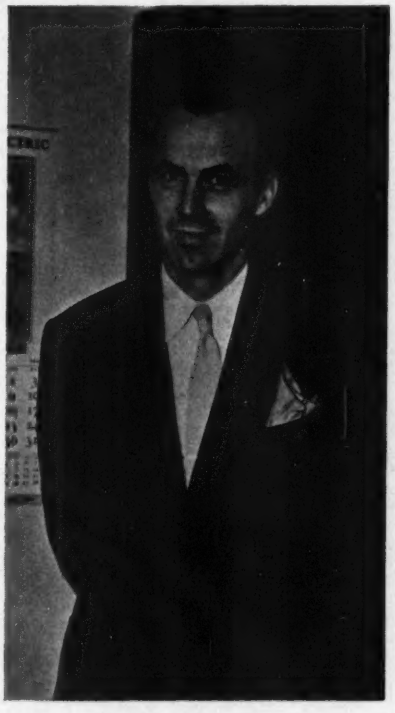
Another money-saving feature is the Automatic Boiler Water Level Control which performs three vitally important duties. First, it starts and stops the boiler feed pump to maintain the water level in the boiler within a ¾-in range. Second, it cuts off the oil burner or stoker if the water in the boiler should reach a dangerously low level. And third, it can be wired to sound an alarm when the low water cut-off point is reached. Control is fitted with Monel float, has specially constructed bellows to eliminate packing, and is constructed with all operating parts isolated from steam and hot water zone.

Additional equipment includes receiver, stand, thermometer, gauge, make-up valve and strainers.

Detailed literature covering the line of Westco Boiler Feed Systems is now available. For further information regarding equipment to meet your specific requirements, write or wire Micro-Westco, Inc., 108 State Street, Bettendorf, Iowa. Pacific Coast Distributors are Westco Pump Sales Co., 318 East 3rd St., Los Angeles, Calif.—Westco Pump Sales Co., 560 7th St., San Francisco, Calif.

The Unusual Is His Specialty

How thick is a coat of paint? What is the stress in this or that member of a steel structure? What is the magnitude and phase angle of the unbalance in a rotating machine? Such questions as



P. G. Caldwell

these are answered electrically by the newly developed equipment which P. G. Caldwell is specializing in for General Electric.

Having participated for several years in the development of special electrical equipment for answering perplexing questions encountered in present day manufacturing, Mr. Caldwell will now be located in G. E.'s Los Angeles office.

Among the applications of special electrical devices for helping solve manufacturing and design problems which Mr. Caldwell has made are: The electric strain gage for measuring the stress in any structural member such as in a railroad bridge or aircraft framework; electric thickness gages for measuring the thickness of non-magnetic coatings such as paint or plating on iron or steel; equipment for measuring vibration occurring in rotating machines, engines, motors, etc., as well as that occurring in stationary objects; equipment for analyzing noise as to quantity and to quality. The extensive manufacturing of the Pacific Coast will provide a broad field for the continuation of Mr. Caldwell's activities.

Import Taxes Extended In 1940 Revenue Act

The commissioner of customs has issued the following Treasury Decision (T. D. 50203) relating to the extension of the expiration date on import taxes, including those on crude petroleum, fuel oil, gas oil, gasoline, lubricating oil, etc.

"Section 209 of the Revenue Act of 1940 (Public, No. 656, 76th Congress) amends section 3452 of the Internal Revenue Code, as amended, by striking out '1941' wherever appearing therein and inserting in lieu thereof '1945'.

"Pursuant to the authority contained in section 251 of the Revised Statutes (U. S. C. title 19, sec. 66), section 624 of the Tariff Act of 1930 (U. S. C. title 19, sec. 1624), and section 3431 of the Internal Revenue Code, and in accordance with section 209 of the Revenue Act of 1940, all pertinent customs regulations are hereby extended to govern the assessment and collection of the import taxes authorized by I. R. C., Sec. 3420 for the period from July 1, 1941 to June 30, 1945, inclusive."

Newhall-Potrero Well Cores For Oil Horizon

Newhall-Potrero Oil Co. is coring for the top of the Modelo in its semi-wildcat, Ferguson No. 1 at Newhall-Potrero. Last reported below 7325 ft., the well is seeking and easterly extension of the production found by Barnsdall Oil Co. on the Rancho San Francisco property.

In the proved portion of the field, Barnsdall is coring the Third zone at 7390 ft. in No. 12 and is drilling near the 5000 ft. level in No. 13. No dry holes have yet been drilled in the field.

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Oil Men's Calendar

Calif. Natural Gasoline Association. **Los Angeles Chapter**—Meets 1st Thursday Each Month, Barker Bros. Bldg., Los Angeles—Dinner at 6:00 (Optional). **Taft Chapter**—Meets Third Thursday Each Month.

American Society of Mechanical Engineers—Los Angeles Section—Meets 2nd Thursday Each Month—Barker Bros. Bldg., Los Angeles. Dinner at 6:30 (Optional).

September

3-5—American Society of Mechanical Engineers, Spokane, Wash.
9-13—American Chemical Society, Detroit, Mich.
9-13—National Tax Association Conference, Hotel Pennsylvania, New York.
24-25—Society of Automotive Engineers, National Tractor Meeting, Schroeder Hotel, Milwaukee, Wis.
30-Oct. 1—National Lubricating Grease Institute, Annual Convention, Stevens Hotel, Chicago, Ill.

October

3-5—North American Gasoline Tax Conference, Whitley Hotel, Montgomery, Ala.
7-10—American Gas Association, Atlantic City, N. J.
7-11—National Safety Congress and Exposition, Stevens Hotel, Chicago, Ill.
12 — Automobile Manufacturers Assn., 1940 Auto Show, New York.
14—Society of Automotive Engineers, Annual Dinner, Hotel Commodore, New York.
15—National Stripper Well Association, Dallas, Texas.
16-18—Independent Petroleum Assn. of America, 11th Annual Meeting, Dallas, Tex.
17-18—American Institute of Mining and Metallurgical Engineers, Petroleum Division, **Los Angeles, Calif.**
24-26—American Institute of Mining and Metallurgical Engineers, Petroleum Division, Tulsa, Okla.

California Crude Oil Production

Two Weeks Ended August 16, 1940

	August Daily Quota	Average Daily Production	Excess
San Joaquin Valley			
Belridge—North	11,106	10,387	*719
Belridge—South	2,126	2,076	*50
Buena Vista	15,789	16,399	610
Canal	5,543	5,849	306
Coalinga-E. (Eocene)	18,662	19,172	510
Coalinga—East-West	14,690	10,257	*4,433
Cole's Levee	6,909	8,027	1,118
Edison	2,234	2,429	195
Elk Hills	6,803	12,148	5,345
Fruitvale	5,639	6,049	410
Greeley	4,601	4,594	*7
Kern Front	7,051	5,720	*1,331
Kern River	6,860	4,030	*2,830
Kettleman No. Dome	33,232	46,234	13,002
Lost Hills	3,890	3,564	*326
McKittrick	3,870	3,601	*269
Midway	36,078	42,063	5,985
Mount Poso	8,949	10,120	1,171
Mountain View	6,987	7,859	872
Rio Bravo	9,128	9,783	655
Round Mt. and Coffee Canyon	6,965	7,330	365
Ten Section	9,967	10,393	426
Wasco	1,633	1,600	*33
Other Fields	4,042	3,615	*427
TOTAL	232,754	253,299	20,545
Coastal Counties			
Elwood	3,313	3,505	192
Rincon	2,755	4,707	1,952
Santa Maria	5,820	4,253	*1,567
Gato Ridge	2,108	4,258	2,150
Santa Maria Valley	16,079	17,002	923
Santa Paula-Newhall	6,001	6,537	536
Ventura Avenue	32,150	34,220	2,070
Other Fields	5,256	5,269	13
TOTAL	73,482	79,751	6,269
Los Angeles Basin			
Alamitos-Seal Beach	6,884	7,516	632
Brea-Olinda	7,914	6,147	*1,767
Coyote—East	3,856	3,786	*70
Coyote—West	9,385	7,636	*1,749
Domingues	17,661	22,215	4,554
El Segundo	2,010	2,088	78
Huntington Beach—New and Old	21,987	25,836	3,849
Inglewood	11,616	12,713	1,097
Long Beach	37,830	43,898	6,068
Montebello	5,633	3,725	*1,908
Montebello-West End	17,131	14,638	*2,493
Playa del Rey	3,869	4,038	169
Richfield	6,833	8,916	2,083
Rosecrans-Athens	8,317	11,126	2,809
Santa Fe Springs	23,166	26,659	3,493
Torrance	5,126	4,942	*184
Torrance "34" and "D & B"	5,597	5,610	13
Wilmington	77,756	84,104	6,348
Other Fields	4,505	4,519	14
TOTAL	277,076	300,112	23,036
STATE TOTAL	583,312	633,162	49,850

*—Shortage.